Pit and Quarry
With which is consolidated
CEMENT-MILL & QUARRY
September 7, 1932

SEP 12 1932

Let's Do Something!

We dislike the complacency that accepts business depressions as inevitable occurrences. We disapprove the fatalistic attitude that throws up its hands in the face of calamity, and then bewails the fact that supernatural agencies — whatever these may be — do not rush in to alleviate conditions that man has created but is too lazy or too stupid to correct. We have no sympathy for the philosophy that boasts of its accomplishments but shirks the responsibility for its errors. We condemn the indifference which the average man shows to urgent problems that confront us all.

Politicians, business men, quack economists, the man on the street — everyone has discussed the causes and possible solutions of our difficulties as these have been repeated and passed around from mouth to mouth. Yet the causes remain unknown and the solution undiscovered. One man says the country is too dry, another says it is too wet; one economist says our salvation lies in a balancing of the budget, another says a balanced budget is no virtue; one business man says that only a return to normal can help us, another says that the average business man is afraid to face a return to normal; one politician lays our troubles to too much Republicanism, another places the blame on too little Democracy. And so it goes—words strung on words, loud voices and waving arms penetrating and clawing the air—the same old claptrap of the last hundred years, while sanity sits apart, waiting for a chance to return.

Who is earnestly trying to discover the causes of these trials that beset us? Where is there a laboratory in which conditions can be studied? Where is the man who has even so much as suggested that the scientific method should be applied to economic problems as it has been to physical matters? Where is someone willing to attack the question as a scientist or engineer would?

In the face of any such effort stands the spector of inevitability, that abject helplessness, that sense of futility, that complete despair that fetters the minds and cramps the efforts of men in all walks of life. How can one solve a problem, if he does not believe it solvable? How can one discover the causes of his difficulties, if he believes them undiscoverable? How can he even begin to think about the problem, if he does not consider it susceptible of study and analysis? How can he adopt any natural measures for meeting it, if he believes that his troubles are the result of supernatural causes?

Of course, if everyone insists on believing that economic trials, such as that of the last few years, are inevitable, they are certain to recur. If everyone insists that nothing can be done about it, we can be certain that nothing will be done about it. The problem will not respond to intelligent study, if no one is willing to give it intelligent study. It will not solve itself, and as for the supernatural agencies —well, apparently no one has found the magic word.

There are too many people like the type of engineer whom Henry Ford avoids —the man who "knows too many things that can't be done." Too many people are willing to take an economic licking lying down; too many are willing to gaze in open-mouthed wonder at their neighbors, hoping that among them may be found the all-saving leader. This is nonsense, but now that recovery has commenced and as yet only a few are willing to meet it half way by standing up, it is sheer cowardice. The storm is passing, yet people still crowd the cyclone cellars under the spell of a terror that should have run its course. Can not something be done to put these timid people on their feet?

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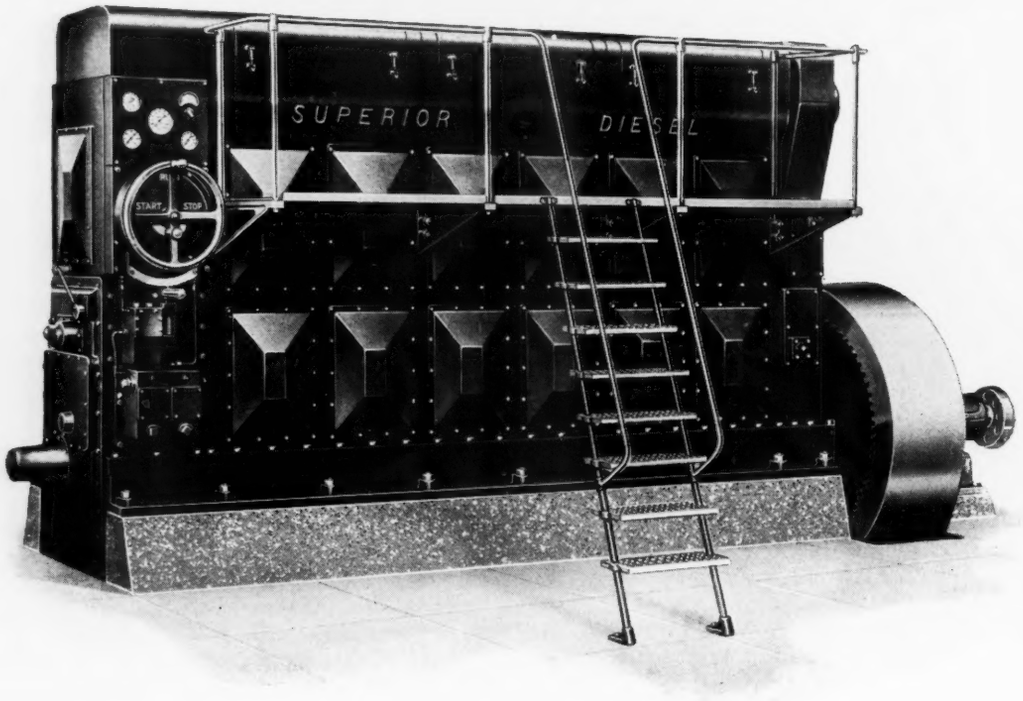

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Berlin, Germany

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Volume 24 September 7, 1932 Number 12

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VOLUME 24 NUMBER 12

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, SEPTEMBER 7, 1932

Cement Shipments for Hoover Dam Continue

JOB YEAR AHEAD OF SCHEDULE

From fifteen to twenty car-loads of cement are being shipped daily from the Crestmore, Cal., plant of the Riverside Portland Cement Co. to the Hoover Dam, most of it for use in constructing the diversion tunnels for the dam. The California Portland Cement Co. is also shipping cement in quantities to the dam from its plant at Colton, Cal.

Six Companies, Inc., contractors for the dam, are reported to be a year ahead of schedule on the big construction project. Work of building and lining the diversion tunnels is going forward rapidly, an average of 25,000 cu.yd. of concrete being consumed daily, said to be a construction record. Diversion of the Colorado River through the tunnels is now set for some time next November. The aggregates plant several miles up river is working at capacity.

Five additional cableways across the river are soon to be built to supplement the two already in service. Each cableway, used to transport materials and machinery, will be capable of handling from 100 to 125 tons. They will cost approximately $750,000 to construct.

Boulder City, Nev., has grown to a small metropolis of 6,500 inhabitants, most of whom are employed on the huge project.

Cement-Mixing Barge Is Sunk; Loss Is $100,000

Loaded with five carloads of cement and equipment valued at $100,000 the cement-mixing barge of the Crosby Lighterage Co. being used in reconstruction of the bridge approaches, filled with water and sank in 12 feet of water in the harbor at Seattle, Wash., recently. A steel hoisting tower toppled and splintered the barge, according to reports.

O. A. Malone, Developer of Cement Stucco, Dead

O. A. Malone, head of the California Stucco Products Co. of Los Angeles and widely known in the cement and construction industry for his creation and development of Portland-cement stucco textures and colors, died August 25 at his home in Los Angeles following a short illness. For many years Mr. Malone coöperated with the Portland Cement Assn. in the development of stucco textures, having traveled throughout the country giving demonstrations before prominent groups of architects.

Kelley Island Acquires New 8,000-Acre Deposit

Approximately 8,000 acres of limestone deposits near Alpena, Mich., have been acquired under lease by the Kelley Island Lime & Transport Co., operator of one of the largest crushed-stone plants in the country in that vicinity. Development of the holdings is to follow on an extensive scale, according to reports.

The first step will be the construction of a railroad from the new deposit to the plant near the shores of Lake Huron.

Union Portland to Fill Utah-Idaho Dam Award

The Union Portland Cement Co. of Salt Lake City, Utah, will handle the contract for cement to be used at Hoover Dam, obtained by the Utah-Idaho Cement Co. which failed to carry out the contract. The Utah-Idaho company is in receivership, and the First Savings Bank of Ogden, the receiver, petitioned the court recently to grant permission to have the contract transferred to the Union company, that company to pay the sum of 3 c. per bbl. to the receiver.

The contract calls for delivery of from 40,000 to 50,000 bbl. at $1.12 a bbl., so that the consideration will total from $1,200 to $1,500.

Portable Plant Set Up to Handle Highway Job

A portable crushing and screening plant has been delivered by the Iowa Manufacturing Co., of Cedar Rapids, Ia., to Carl C. Stephan, of Ashton, Ill.

Mr. Stephan has set up the outfit in a gravel pit and is turning out materials for use in paving a stretch of concrete highway near Ashton.

Trade Groups Gather to Discuss Congress

PUSH PLANS FOR PUBLICITY

Plans for the coming Highway and Building Congress, to be held in Detroit, Jan. 16 to 20, 1933, moved several steps toward definition, when the General Committee on Arrangements held its third meeting in the offices of the American Road Builders' Assn. in Washington on Aug. 25. Topics suitable for discussion at the highway sessions on Thursday, Jan. 19, and at the building sessions on Friday were discussed, emphasis being laid on such important questions as the diversion of gasoline-tax funds to non-highway purposes, the economic importance of highways in our national life and growth, the activities of certain forms of transportation which compete with highway transport, the necessity for a restoration of public confidence in real-estate securities, etc.

All groups interested in the purposes of the congress—material producers, contractors, highway users, and the trade press—were represented and participated in the discussions. The matter of publicity received much attention because of its value in winning national recognition, not only for the congress, but also for the important industries—highway and building—which will join forces on that occasion. V. P. Ahearn was appointed chairman of the general publicity committee which will review all releases.

As previously reported (PIT AND QUARRY, Aug. 10, p. 9), the following ten organizations have already agreed to participate: American Road Builders' Assn., Asphalt Institute, Associated General Contractors of America, Construction League of the United States, National Crushed Stone Assn., National Paving Brick Assn., National Ready Mixed Concrete Assn., National Sand & Gravel Assn., Portland Cement Assn., and Truck Assn. Executives of America. Other associations have been invited to take part and are now considering the matter.

The program as already arranged provides for concurrent conventions of the material-producer associations during the first three days of the week—the crushed-stone group on Monday, Tuesday and Wednesday; the sand-and-gravel group on Tuesday and

(Continued on page 9)

Programs for Safety Congress Announced

MEET IN WASHINGTON OCT. 3-7

First announcement of details of the program for the twenty-first annual safety congress and exposition of the National Safety Council has been released. The gathering is to be held this year at Washington, D. C., and the dates are October 3 to 7. Headquarters will be the Wardman-Park and Shoreham hotels.

Early indications point to an equally large, if not larger, attendance than last year when the gathering took place at Chicago, according to W. H. Cameron, managing director of the Council, who declares that it will be forcibly demonstrated by attendance at the Congress that the safety movement accepts the responsibility and challenge to save lives during times of economic stress and business depression, as well as in more prosperous periods.

Many unusual new features of practical value are noted in a check-up of the program. For instance, there will be four morning classes on "Safety in Foremanship." Several practical demonstrations are also scheduled, including a dust-explosion demonstration on Tuesday afternoon, October 4, at the United States Department of Agriculture Testing Station, Arlington, Va. This will be of special interest to those concerned with dust-explosion prevention in industrial plants.

Of particular interest to PIT AND QUARRY readers are the meetings of the Cement section, the Quarry section, and the joint gathering of both sections.

The Cement section will assemble Tuesday morning, October 4, in the Palm Court on the main floor of the Shoreham hotel. General Chairman W. L. White, Jr. (Medusa), will preside and open the meeting with his annual report. Election of officers will be next on the order of business, followed by an "Analysis of Accidents in the Cement Industry," by A. J. R. Curtis (Portland Cement Assn.). An unannounced speaker is scheduled to talk on safety from the viewpoint of the executive and the morning session will close with what has been labeled as "In the Wake of the News," by Jack Dempster (Canada). Jack is familiar to all as editor of the section's news letter and is slated for reappointment to that post which he has filled so admirably.

Reconvening in the afternoon, the Cement section will hear Maxwell N. Halsey, a New York traffic engineer, talk on "Building Safety and Facility Into the Highway." Methods of lowering accidents on the highways through the Portland Cement Assn. Safe Drivers' League will be discussed next, the lead being taken by W. W. Hamilton (Alpha) and A. R. Couchman (North American). Arrangements for presenting some ideas on mental hygiene as it affects accidents and the maintenance of the industry's top position in accident-prevention are now being made and the speakers will be announced later.

On the following morning the Cement and Quarry sections will hold their joint meeting with this program:

"Safety in Limestone Mining and Quarrying," C. A. Herbert, United States Bureau of Mines.

"Safeguarding Our Eyes," J. B. Zook, safety director, Great Lakes Portland Cement Co.

"Industrial Health and Its Relation to Industrial Safety," Dr. C. O. Sappington, Chicago.

"Concrete for Safety." A motion picture, with explanatory remarks by A. R. Couchman, safety director, North American Cement Corp.

E. J. Mehren, president of the Portland Cement Assn., will be the speaker at the joint luncheon.

John Prince (Stewart Sand & Material Co.) will open the session of the Quarry section on Thursday morning, October 6. This meeting, too, will be held in the Palm Court of the Shoreham. The program for the Quarry section is not definite as yet, the only address so far scheduled being one on "Visualizing the Mineral and Allied Industries," by M. F. Leopold, one of the safety engineers of the United States Bureau of Mines. Within a few days, however, the section will have its program in shape. It will include a series of 20-minute talks on the 1931 safety contest and the achievements gained through participation in it, and, among other talks and demonstrations, will include an address which will analyze the factors affecting compensation-insurance rates in the quarrying industries.

Michigan Association to Be Host to N. S. & G. A.

When the National Sand & Gravel Assn. holds its 1933 convention at the Book-Cadillac Hotel at Detroit on January 17 and 18, in conjunction with the Highway and Building Congress, its official host will be the Michigan Sand & Gravel Assn.

L. E. Williams of the Ray Sand & Gravel Co., of Detroit, is acting as general chairman of the convention committee.

Utah Blast Tears Down Two-Year Stone Supply

Approximately 50,000 lb. of dynamite was exploded in the quarry of the Union Portland Cement Co. of Salt Lake City, at Devil's Slide, not far from Ogden, recently.

The explosion tore 300,000 tons of rock from the 200-ft. quarry, enough to supply the company's plants for nearly two years, according to B. R. Dorland, superintendent of the company.

News Briefs

California cement industry revives with reopening of plants of Southwestern Portland Cement Co., Yosemite Portland Cement Co., and Calaveras Cement Co.

* * *

Briar Hill Stone Co., Millersburg, O., awarded $40,000 contract for stone for new Canton post-office.

* * *

Smith Stone Quarry near Portland, Ind., suffers $25,000 fire loss.

* * *

Three Lithonia, Ga., granite firms obtain orders to supply 20,000 tons of stone for government jetty work on Florida east coast.

* * *

City commission of Cleveland, O., votes to sell city-owned gravel deposit.

* * *

Mysterious blast destroys steam shovel in pit of Service Sand & Gravel Co., at Newburgh Heights, O., near Cleveland.

* * *

Louisville Cement Co. increases working force to 250 at commercial stone quarry in Milltown, Ind., following influx of orders for stone for road building.

* * *

Suffern Stone Co., Suffern, N. Y., ordered by village board to abate nuisance resulting from excessive dust and alleged damage from blasting following complaints by residents.

* * *

Greenville Sand & Gravel Co., Greenville, Miss., awarded contracts for 42,000 tons of sand and gravel for state highway work.

Proposal to Tax Truck Loads Fails in Indiana

Adjournment of the special session of the Indiana legislature thwarted efforts to pass a drastic ton-mile tax on trucks and busses.

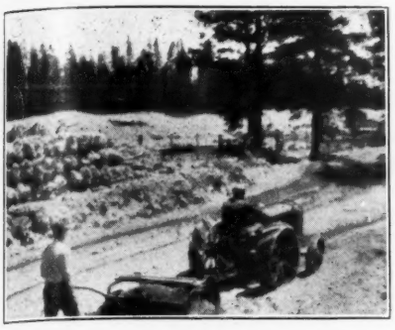
The House passed the truck tax bill but it was amended in the Senate to provide a levy of one mill per ton-mile. Other amendments were offered and defeated and the bill failed to receive a constitutional majority. Proponents of the ton-tax contended it would yield high revenue and remove "unfair competition" with railroads.

Construction Materials Corp. Leases Dock Area

The Construction Materials Corp. of Chicago has leased 60,000 sq.ft. of wharf space from the Twin City Terminal Dock Corp. at St. Joseph, Mich.

The corporation will not erect any buildings on the property, but will use it for storing sand, gravel, crushed stone, concrete and general building materials.

Excavating Lump Pumice



THE above picture shows the method employed in recovering lump pumice from the C. E. LaRitchie deposit near Chemult, Ore. The tractor-drawn scraper-plow allows the material to be taken from some depth and, therefore, unweathered and free of organic matter.

Shipments of pumice from this deposit were first made by W. A. T. Agard and, according to Mr. Agard, they were the first ever to be shipped out of Oregon. Mr. Agard is now devoting his energies to the production of a pumice sand-gravel deposit near Chemult.

Bldg. Congress *(From page 7)*

Wednesday; and the ready-mixed-concrete group on Monday—and a single combined show for all three running from Monday to Wednesday—all at the Book-Cadillac Hotel. As explained above, Thursday will be Highway Congress Day and Friday will be Building Congress Day. The annual road show of the American Road Builders' Assn. will be held separately at the Municipal Airport. The entertainment features will include a Congress Smoker on Tuesday night, a Congress Ball on Wednesday night, and a Congress Banquet on Thursday night. Each of these events will be open to all who attend the congress.

The following persons were present at the third general committee meeting:

V. P. Ahearn (National Sand & Gravel Assn. and National Ready-Mixed Concrete Assn.)

J. R. Boyd (National Crushed Stone Assn.)

R. D. Bradbury (Wire Reinforcement Institute)

J. S. Burch (Wire Reinforcement Institute)

F. J. Carmody (Ullman Feature Service)

W. P. Darwin (Portland Cement Assn.)

J. W. Hannen *(Michigan Roads and Airports)*

E. J. Harding (Associated General Contractors of America)

G. T. Heckert (Construction League of the United States)

H. J. Kirk (Associated General Contractors of America)

S. A. Phillips (PIT AND QUARRY)

G. F. Schlesinger (National Paving Brick Assn.)

W. A. Sutherland (Truck Assn. Executives of America)

A. C. Toner (Portland Cement Assn.)

William Ullman (Ullman Feature Service)

C. M. Upham (American Road Builders' Assn.)

Proposed Alabama Sales Tax Would Hit Minerals

The Alabama Legislature is in special session considering the passage of a general retail sales-tax in order to obtain funds to balance the budget of the state, which shows the largest deficit in the history of the state.

Two bills have been introduced and a sales tax on certain minerals are included in the bill. Briefly they are:

Effective after Aug. 30, 1932, upon producers of gas, limestone, asphalt or other minerals, the tax would be one per cent. of the value of the article produced as shown by the gross proceeds.

A tax of two per cent. would be levied on brick, drain tile, building tile, pipe, Portland-cement products, and clay products.

Pasadena Dam Cement to Be Supplied by 4 Firms

Contracts for the cement to be used in constructing the new Pasadena Dam in San Gabriel Canyon have been awarded to the California Portland Cement Co., Riverside Portland Cement Co., Monolith Portland Cement Co. and the Southwestern Portland Cement Co., all of California. The total award in which these four firms share is for 471,000 bbl., and the combined price at which the job was taken was $776,000.

As previously announced, the aggregates for building the dam will be supplied by the Consolidated Rock Products Co. of Los Angeles and that company is now constructing a new plant at Azusa, Cal., to handle the production for the dam job.

Betterments Cut Costs and Increase Capacity

The Lutz Stone Co., Oshkosh, Wis., recently completed improvements to its plant which resulted in greater economy of operation and an increase in capacity from 80 up to over 100 tons per hour. In the quarry, trucks replaced a locomotive and cars. The Allis-Chalmers 12-in. primary crusher was moved from the plant to the quarry level and the stone is elevated to the plant by a belt conveyor which replaces the incline and hoist formerly used. In the plant a 4-ft. by 8-ft. Allis-Chalmers 3-deck vibrating screen was installed. Fine sizing is done by two 3 by 8-ft. Universal single-deck screens.

Illinois Quarries Will Resume After Idleness

The Shelterville stone quarries near Rosiclare, Ill., idle many months, will resume work shortly. The property has been leased by Bean & Masters Sand & Gravel Co. of Golconda, Ill., from A. C. Boyd of Mound City and W. S. Watson, Sr., of Golconda. A 300-ton derrick to handle stone is being installed and equipment for handling rip-rap will be added.

Wisconsin Producers Effect Organization

OFFICERS, DIRECTORS CHOSEN

Final organization of the sand, gravel and crushed-stone producers of Wisconsin was completed August 19, at a meeting held in the Loraine Hotel, Madison, Wis., with the election of officers and directors. The new organization is incorporated under the name of Wisconsin Materials Assn., and will maintain its head office at Madison, Wis. The purpose of the association is to promote the best interests of the industry, to maintain a credit-information office, and to disseminate general information regarding the uses of sand, gravel and crushed-stone for the betterment of construction work.

Officers elected were: A. A. Laun, Elkhart-Moraine Sand & Gravel Co., president; George Brew, Waukesha Washed Sand & Gravel Co., vice-president; Richard W. Lutz, The Lutz Co., Oshkosh, secretary-treasurer; Messrs. Laun and Brew, together with Mrs. M. O. Gillen of the Waukesha Lime & Stone Co., Waukesha; Louis H. Ebbe, of Rasmussen & Ebbe Sand & Gravel Co., Waupaca; and A. O. Ayres, of the Eau Claire Sand & Gravel Co., Eau Claire, constitute the board of directors.

Gordon F. Daggett, civil engineer of Milwaukee, Wis., was elected executive secretary and materials engineer and will be in charge of general activities. Mr. Daggett was formerly materials engineer of the Wisconsin Highway Commission and, later, executive secretary of the Wisconsin Mineral Aggregate Assn.

A constructive program for the new association is being worked out and by coöperation with the railroads, the highway commission, city engineers, and others having to do with the industry it is hoped that much may be accomplished.

There are approximately 60 commercial producing plants in the industry in Wisconsin and the activities of the new organization will, therefore, be far-reaching.

Gravel Producers Merge in Kentucky, Tennessee

The Sandgravel Co., Inc., has been formed in Paducah, Ky., by the consolidation of the Paducah Sand & Gravel Co., located at the foot of Campbell St., Paducah, and the James Sand & Gravel Co., Johnsonville, Tenn., and will operate six Ohio River plants besides some in Tennessee.

Three new plants will be established, one at Louisville, another at Henderson, Ky., and another at Kutawa, Ky. T. L. Herbert, Jr., of Nashville, Tenn., is president of the new company. P. B. Herbert is secretary and treasurer. Steve Click is in charge of sales and will operate the Louisville plant.

Construction Awards Lack Encouragement

AUGUST FAILS TO SHOW GAIN

New construction contracts awarded in the thirty-seven states east of the Rocky Mountains during the period from August 1 through August 15 totaled $55,378,500, according to F. W. Dodge Corp. This contrasts with $116,553,100 for the corresponding half-month of 1931. During all of July a total of $128,768,700 was reported for the thirty-seven states which compared with $113,075,000 for the entire month of June and $285,997,300 for July, 1931. The advance over the previous month's contract total was produced by larger awards for non-residential building and public works; residential contracts and awards for public utilities showed declines from their respective June totals.

For the first seven months of the year contracts for all construction totaled $795,848,400; this was 38 per cent. as large as the contract record shown for the corresponding seven months of 1931. It is becoming apparent that the decline for the full year 1932 from 1931 will not be as drastic as that which has occurred during the first seven months; the full year should show a total between 40 and 45 per cent. as large as the figure of $3,092,849,500 recorded for the full year 1931.

Of the thirteen districts comprising the territory east of the Rocky Mountains eight report construction contract totals in July larger than those shown for June: the Metropolitan New York; Middle Atlantic; Pittsburgh; the Central Northwest; Southern Michigan; St. Louis; Kansas City; and Texas districts. In addition, gains were scored in July over July, 1931, in the Central Northwest and St. Louis territories.

N. Y. Producer Acquires Deposit Near Whitehall

The Amsterdam Stone Crushing Co., of Amsterdam, N. Y., has leased for a period of years an extensive stone deposit near the village of Whitehall.

The firm has orders on hand for delivery of a considerable quantity of aggregates for state road work in that area and about 30 men are employed at present.

Illinois Solons Plan to Raid Gasoline-Tax Fund

The Illinois Legislature was scheduled to gather in special session at Springfield on September 6 at the call of Governor L. L. Emmerson to consider means for relieving unemployment in the state.

While the method of raising funds was not announced in the call for the session, it is understood that an attempt will be made either to increase the present gasoline tax from 3 c. to 5 c., the additional 2 c. to go to the relief fund or, if that fails to gain support, to divert half of the present gasoline-tax income to relief purposes.

Opens New River Plant Near Chillicothe, Ohio

A completely modern sand-and-gravel plant, costing approximately $75,000, has just been put into operation by Brewer & Brewer & Sons, Inc., on the banks of the Scioto River near Chillicothe, O.

The plant has an ordinary capacity of 125 tons per day, but is capable of being pushed to the limit of 200 tons. Up-to-date screening, washing and crushing facilities are included in the equipment. Construction began April 1 of this year and was finished early in August.

W. F. Hopkins, of Columbus, O., has been named general superintendent. Mr. Hopkins also superintended the construction, while credit for the general design of the plant goes to C. G. Milburn of the Milburn Machinery Co., Columbus.

Campaign to Urge Road Upkeep Gains Strength

The Maintain-Our-Roads campaign begun recently by the American Road Builders' Assn., is receiving the enthusiastic support of all federal, state and county public highway officials. The campaign is under the direction of C. N. Conner, engineer-executive of the American Road Builders' Assn.

A survey of the attitude of state highway departments shows that active support in the Road Builders' campaign will be given by the states. Attention is called by state highway officials to the immense cost of restoring the roads to their former condition if they are allowed to go down in the present emergency. Continuous maintenance is being urged by the states in conferences with county officials and in statements to the public.

Highway Engineer Heads New Rock-Asphalt Firm

The Rock Asphalt Co. of Utah has been organized and incorporated with offices in the Dooly Bldg., Salt Lake City. The capital is $100,000. The company will produce paving and road materials. The quarry and plant are to be located at Sunnyside, Utah.

Howard C. Means, former Utah State Highway Engineer, is president and general manager of the company; Arthur N. Smith of Price, Utah, is vice-president, and Mrs. Viola DeHon, who has been in the employ of Mr. Means for some time past and was formerly in the mining department of the state, will be secretary-treasurer.

Hand Labor Ordered in Road Construction

MINIMUM RATES OF PAY SET

Widespread use of hand labor in road construction, in which federal-aid funds provided by the Emergency Relief and Construction Act will be used, has been ordered and the regulations for such work have been issued by the Secretary of Agriculture and the U. S. Bureau of Public Roads. Among the specific items are the following:

Hand tools such as picks, shovels and wheelbarrows, or team tools such as scrapers and carts, are to be employed for all excavation and back-filling. Cement and reinforcing steel may be hauled by trucks to the site of operations but must be unloaded by hand. All aggregates are to be unloaded from cars by hand and are to be handled from stock-piles to the mixer by hand shovels, wheelbarrows or carts.

Where aggregates are produced in roadside plants, it is specified that they be loaded by hand at the crushing plant. In cases where the crusher is set at approximately the same elevation as the quarry floor the stone must be transported to the crusher by hand or team methods. Similarly, hand labor or team power is to be used in gravel pits for transporting material to screening plants where feasible. It is also specified that stripping be done by team or hand labor, or both.

In addition to specifying hand labor, work accomplished under the Emergency Relief Act must be done at minimum wage rates as prescribed by the Bureau of Public Roads. These will vary in the different sections of the country and have already been set and approved in some states. In Missouri, a minimum rate of 35 c. an hour for unskilled labor and 50 c. for skilled help is to be paid. The maximum week of 30 hours, as required by the act, is specified. In Louisiana the Highway Commission, in calling for bids to be opened September 7, has announced that the minimum wage scale will be 20 c. per hour for the 30-hr. week. The minimum rate in Ohio will range from 35 c. to 50 c.

The highway department of Virginia has set the minimum hourly rate for unskilled workers at 20 c., which is an increase of 5 c. over the rate which has prevailed in that state recently. The minimum rate in Maryland will vary from 25 c. to 35 c., depending upon the location. This difference is accounted for by the fact that the cost of living is said to vary considerably in that state. Drivers of trucks and tractors, as well as teamsters, will receive 25 per cent. more than the minimum wage and some classes of skilled workers will be paid 50 per cent. more than the minimum.

Northwestern Cement Firms Launch Attack

PREJUDICAL RATES CLAIMED

Rates said to amount to a subsidy to California cement manufacturers are being protested by northwestern producers, including the Spokane Portland Cement Co. and the Lehigh Portland Cement Co., according to advices from Washington, D. C.

These companies, the one having its plant at Irwin and the other at Metaline Falls, filed a joint complaint with five other cement manufacturers in Washington and Oregon, asking the interstate commerce commission to restrain the railways from permitting continuance of low rates from California to northwestern points.

Markets for the protesting companies are largely centered in the Spokane, Seattle, Tacoma and Portland areas, the complaint asserts. "Competition for these markets," it is pointed out, "has always been keen and active between the seven complaining companies. Large California producers, in spite of the fact that the California market is alleged to be broad, are without competition excepting among themselves.

"When shipping to the Coast for trans-shipment by boat to Oregon and Washington ports, these California companies have the advantage of a special reduced freight rate, considerably lower than the local intrastate or interstate rate," the complaint holds.

Oregon Gravel Producer to Construct New Plant

Because the plant of the Independent Sand & Gravel Co. at Independence, Ore., was deemed unsafe and closed by the Oregon Labor Commission, and because the company has considerable unfilled tonnage to be delivered for highway work, a new plant is to be erected shortly, according to C. G. Skinner, head of the concern.

It is hoped that the new operation will get into production by the time the bins at the old plant have been emptied.

Improved Outlook Seen for Heavy Construction

New building in the United States for the first seven months of this year amounted to approximately $875,000,000, according to the building survey undertaken by the Indiana Limestone Co.

Commenting on the building outlook A. E. Dickinson, president, said: "Despite the usual summer dullness, reports clearly reflect an improved outlook. The overcautious attitude which has stood in the way of recovery seems to have been corrected. Optimism throughout the country is more pronounced than it has been for many months.

"Reports from several hundred cities throughout the country show an actual 10 per cent. shortage of homes. Only 14 per cent. of the cities indicate an overbuilt condition.

"Awards for heavy building showed a gain in July, which month had the highest weekly average in contract awards since November. This is particularly encouraging because this class of work topped public building activity for the first time since March."

Five Alabama Producers Share in Cement Awards

A note of optimism is being sounded in Birmingham, Ala., cement circles recently following the announcement that the State Board of Administration at Montgomery had given contracts to Birmingham cement companies for 500,000 bbl. of cement to be delivered at various times during the next year. The total amount involved is around $850,000.

Five companies will share in this order. They are the Alpha, Lone Star, and Lehigh of Birmingham, Universal Atlas at Leeds, and National at Ragland.

Marquette Officials See Water-Terminal Opening

Officials of the Marquette Cement Manufacturing Co. were present on August 15 to witness the departure of the first train of steel barges from the company's new waterway terminal at Peru, Ill.

The barges, carrying 16,000 bbl. of cement, were towed away by the Diesel-powered tug, *William Dickinson*, the shipment being consigned to unloading points on the lower Mississippi River, where it is to be used in government flood-control work.

Sand Plant Being Built by San Francisco Firm

A new sand plant is being constructed by the Kaiser Paving Co. of San Francisco on property owned by the Southern Pacific R. R. near Byron, Cal.

Only sand suitable for asphalt paving work will be produced. The plant is to be electrically driven with power supplied from the lines of the Pacific Gas & Electric Co.

Ohio Stone Concern to Furnish Road Material

The Ottawa Stone Co., of Ottawa, O., recently purchased a Link-Belt stone loader for use in handling crushed stone from storage.

The company has orders for several thousand tons of material to be used in street and highway construction projects in that vicinity.

Regular Federal-Aid Bill Fails of Passage

HELD OVER UNTIL DECEMBER

The regular federal-aid bill (S. 36) failed to pass the House of Representatives before adjournment, although it passed the Senate several weeks ago on a *viva voce* vote. The bill provided $125,000,000 for each of the years 1933 and 1934, subject to a deduction of $16,000,000 as a repayment of one-fifth per year of the $80,000,000 emergency advance of 1931, a net of $109,000,000 for federal-aid highways in both 1933 and the year following.

On reaching the House the bill was referred to the House Committee on Roads, which reported it back to the House favorably but with an amendment changing the $125,000,000 to $100,000,000 per year, or a net of $84,000,000. Parliamentary obstacles in the House and failure to persuade the Rules Committee to give the bill a special rule resulted in the regular federal-aid bill becoming hopelessly deadlocked, although a compromise measure somewhere between the Senate and the House figures was confidently expected. The bill was called up by Mr. Almon on a motion to suspend the rules, but the determination of the opposition to all highway appropriations forced the friends of the bill to surrender, and the bill went over indefinitely.

The bill will undoubtedly be one of the first bills to which the House will give its attention when Congress convenes in December. It is assured of a comfortable majority, and when the House takes action, the measure will go at once to conference without the necessity of being introduced in the Senate. By using future federal-aid highway funds as ultimate security for advances to the states for poor relief Congress has placed itself in the position of being required to enact appropriations for highways in order to reimburse the federal government for its loans to the states totalling $500,000,000 in the past two years—$200,000,000 for emergency highway construction and $300,000,000 for those states unable to care for their distressed citizens.

Gets Ballast Contract from Wabash Railroad

The Erie Stone Co. of Huntington, Ind., has been awarded a contract to supply the Wabash Railroad with approximately 15,000 tons of crushed stone for ballast, Herman Nagel, manager of the plant, has reported.

The crushed stone is being used for ballast between Peru and Logansport. Several cars of the stone have already been shipped.

Editorials

Corporate Finance

AMONG the factors which contributed toward the aggravation of the recent business slump are the aberrations of corporate finance. Instead of bonds, stocks became the favorite form of financing, advantage having been taken of high money rates and the gullibility of the public for stock issues. The long-term-investment qualities of common stocks appealed to the average man as well as the possibility of quick profits, so that stock financing became the accepted method of obtaining capital. The ability to retire funded debts with the capital so acquired and the ability to provide for new construction by the sale of securities which carried no fixed charges were added inducements. There was the further temptation created by the high call-money rate, so that funds were often raised for purposes that had no connection with the requirements of business. The money obtained through the sale of common stocks made at a cost of less than 5 per cent. was lent on call at rates that netted from 8 to 10 per cent. This piling of credit on credit had the direct effect of reducing purchasing power by the suspension and reduction of dividends. It resulted in a tendency toward overcapitalization which later necessitated the squeezing out of the water inherent in the use of such a financing method. These stocks were purchased too often with borrowed money which had to be repaid over a long period of time. The stock method of financing impaired credit to such an extent that the corporations involved could not benefit from conditions favorable to bond financing.

In spite of the lessons taught by the last three years, there are still too many corporations hoping for financial relief through the common-stock method. They are overlooking or ignoring the advantages which accrue from the proper kind of bond financing and the use of short-term securities when interest rates are high. The excess expansion and new construction encouraged by the stock method of financing, so widely practiced during that period, are largely responsible for the difficult dividend situation of many stocks, a crisis brought about by the ease with which money for unnecessary expansion was obtained. This willingness on the part of the public to invest in unwarranted stock issues resulted not only in making the payment of dividends on such stock often impossible but also in an impairment of the dividend-earning capacity of stock previously issued. At the same time it made bonds seem a less desirable form of investment and forced other corporations, which would normally have resorted to bond financing, to adopt the common-stock method. And, as an inevitable result, it caused disappointment and hardship to many investors and so made the sale of even the soundest investments a matter of great difficulty.

Wise business men in need of additional capital for warranted improvements in their plant equipment will avoid the common-stock method of financing, if they are interested in maintaining their businesses on a sound basis. There may be some immediate gains to be derived from stock selling, but, as recent years have shown, they are almost invariably of dubious value and are certain to entail great difficulties in the end.

Why Not Teaspoons?

SINCE even in normal times politics is not much concerned with common welfare or with what passes for "common-sense," we should not be impatient if, in times like these, the old political make-work policy should overrun us. Men who can justify, under good conditions, the creation of unnecessary jobs in order to win political supporters are certainly not to be found without plausible reasons for following a similar policy when unemployment is common. In fact, with apparently the best of reasons available, who but an idealist would shrink from extending the policy to new and greater lengths?

Michigan and Washington, already experienced in the advantages and disadvantages of the use of hand labor in highway work, have now been joined, according to report, by Ohio. There, the report says, every contract let within the last few weeks has specified the use of hand labor to the exclusion of machine labor. This means, no doubt, that hand shovels are to be used instead of power shovels, loaders and graders, that wherever the interest of efficiency and economy might be furthered by machinery, wasteful hand labor is to be used. It means, too, that Ohio will learn, as Michigan and Washington have already learned, that hand-labor methods will be found much more expensive than machine methods.

Despite the facts that highway bids for hand-labor jobs in Washington run from 38 to 70 per cent. higher than those for machine jobs and that Michigan reports that the use of hand labor, for which more than $10,000,000 has already been spent, is "less economical" than machine labor, other states may be expected to adopt similar policies. This is the object of the regulations issued by the Secretary of Agriculture and of the instructions which have been sent out by the chief of the Bureau of Public Roads and are designed to govern the expenditure of the federal-aid funds made available by the emergency-relief legislation.

Some persons confess their inability to see much difference between this form of work-charity and a system of doles. They believe it would be more sensible to employ machinery to the fullest extent dictated by a true search for economy and then to

distribute the resulting savings in the form of financial help to the many who need it rather than to spread the extra expenditure necessitated by hand labor among the comparative few who perform that labor. In order to describe adequately the policy that has been adopted it is only necessary to point out that it is the fruit of political minds which, in view of many impending elections, are centered on political expediency rather than national good.

Like most remedies, this plan is but a half-measure. We can conceive a thousand ways in which it might be strengthened and made more far-reaching. If power shovels must be replaced by hand shovels in order to give more men jobs, why not substitute teaspoons for the hand shovels, and later the bare hands for the teaspoons? If power road-rollers must give way to hand-rolled barrels or drums, why not replace these with, say, printers' rollers, and these later with gentle foot-tamping? And if in place of power spreaders we must use hoes and rakes, why stop here, when the use of spatulas or mere thumb-and-finger manipulation will keep so many more men busy?

And, if all this is sound economy—dare you doubt it, when our guardians of public welfare have spoken?—why not close our power-operated crushing and screening plants and our cement factories and perform all their necessary operations by hand labor? Rocks can be crushed by beating them one against another, the resulting fragments can be sized by hand picking and rule-of-thumb measurement, expert divers can doubtless be found to scoop up handfuls—not too large handfuls, mind you—of river-bed gravels, active stick-rubbing can probably produce a fire with which to burn the stone, and the finished products can be transported in home-woven bags slung over the shoulders of the work-hungry multitude. What need for expensive processing and grading equipment, or for railroads or motor trucks, with so many unemployed crying for work, even useless work?

Of course, the plan suggests other possibilities. If we can accomplish all these desirable ends by merely laying aside our highly developed power tools, if we can eliminate all the power contrivances that genius has devised to save labor, what use will we have for the roads which these unemployed are supposed to build? The small amount of transportation needed by humanity reduced to neolithic levels can be supplied by still other unemployed hordes trudging along low-cost footpaths. So, what need for highway departments, for organized government in a society so disintegrated, for politicians to guide people who are not going anywhere?

"But now you are carrying the point to ridiculous lengths," cry the alarmed job-holders. "You are aiming now at the very foundations of American liberty, you are assaulting the sanctity of the American home, you would destroy the very bulwarks of civilization. You are radical, you are subversive, you are antisocial, you are just plain simple. Can't you see that if your ideas were carried to such lengths, we, too, would have to go to work?"

Doubtless; but we can not help thinking that if we must make work for real workers temporarily unemployed, why not make work for as many shirkers who are still employed? We make so bold as to ask you, gentlemen, if hand shovels, why not teaspoons; if hand rollers, why not spatulas? And just imagine it: congressmen, aldermen, ward politicians, *et al.* building low-cost roads with low-cost tools. A fitting sequel to the counsels of imbecility!

Pumice Produced by Convict Labor Imported Into United States

By W. A. T. AGARD
Berkeley, Cal.

FOR years pumice has been imported into the United States under a nominal import tariff. But the question is why?

The prisoners on the island of Lipari are condemned not to leave its shores, but may roam within its confines and are paid 6 lire (31 c.) per day while working in the production of pumicestone. The Italian government insists that the prisoners are not convicts and calls them by another name, likely for commercial reasons, for the product of convict labor can not enter the United States.

Now are they convicts or not? Webster's *Dictionary* seems to indicate "yes" and defines a convict as "a person proved guilty of a crime alleged against him, either by verdict of a jury or other legal decisions."

There was a time when Italian pumice was an absolute necessity in this country, but that time passed several years ago when the western states commenced developing their large deposits—among which there are some which are superior in quality to any foreign pumice—but with our labor at $4 per day or 13 times the cost in Lipari. Is it not time to put the law into effect, or protect our industry and workmen with an adequate tariff?

In the latter case, what would be an adequate tariff on foreign pumice? The following suggestion would seem to be an equitable solution. Figuring freight and labor alone gives these results:

Italian pumice, labor	$0.31
Steamer freight to New York	7.00
Total	$7.31
Western domestic pumice, labor	$ 4.00
Freight to New York (part steamer)	14.40
Total	$18.40
Difference	$10.09

This manifests the desirability of a ½ c. per lb. or $10 per ton import tariff on all crude pumice. The tariff on manufactured pumice or its use in manufactured articles should be higher, ranging from ¾ c. to 1 c. per lb. We have the goods and should be encouraged in its production and should be protected against underpaid foreign labor.

Aërial view of Morton plant of Alpha Portland Cement Co., at Phoenixville, Ala., with quarry in background.

Aesthetic Motives in Cement-Mill Design Revealed in Alabama Operation

Alpha Plant at Phoenixville a Splendid Example of Beauty and Utility Combined

AMERICAN industry has long been noted for its ability to combine beauty and utility in its products and its plants. This is evident in the design of many machines not ordinarily thought of in terms of appearance but in which it has been found that efforts made to improve their appearance have made them stronger, safer and more efficient. That this also holds true among architects and engineers is evident from the thousands of beautiful bridges, office buildings and factories to be found throughout the country. It has been amply demonstrated that such beauty can be attained at no additional cost and can, in fact, be made to pay dividends. A workman in a plant where every detail, including his comfort and safety, has been taken into consideration can always be depended upon to do his work cheerfully, efficiently and safely.

The Morton plant of the Alpha Portland Cement Co. at Phoenixville, near Birmingham, Ala., is a splendid example of this practice applied to a cement plant. This plant, after more than five years of operation, still holds its place in the front rank of cement plants in this country by its efficiency and economy of operation and the consistent quality of its product. The plant is compact in design without sacrificing space needed for efficient operation and future expansion. It also has the distinction of being probably the most attractive and the cleanest plant in the industry.

The appearance of a cement plant is not usually an important consideration in its design but in this plant beauty was attained without sacrificing efficiency or unnecessarily increasing the cost of construction. This was done by keeping appearance as a secondary factor in the design and in the choice of construction materials and equipment. In the main buildings structural steel was used with walls of Gunite. All other construction is of concrete, except the auxiliary building which is made of concrete blocks coated with Gunite to harmonize with the other buildings. All the roofs are of concrete tile covered with a specification roofing. An architect, working in coöperation with the engineers, was largely responsible for the appearance of the plant. The employment of a landscape gardener in laying out the grounds was another unusual feature. Wherever possible existing trees and shrubs were allowed to stand; other trees, shrubs and flower beds were planted and the ground about the plant was leveled and sodded. Concrete drives and walkways were laid, and street lamps on concrete posts along the main drives make the plant attractive at night as well as in the daytime.

As a result the grounds now present the appearance of an unusually well-kept park. A regular

force of men sweeps the walks, mows the grass, washes windows, looks after the flowers, etc., and their work is supervised just as carefully as any other part of the operation. Waste-boxes at various points about the plant and grounds and "Keep off the Grass" signs assist in maintaining a trim appearance. Employees are constantly reminded of the fact that cleanliness and safety go together.

A Portland Cement Assn. safety trophy is an important contribution to the beauty of the grounds and is a tribute to the safety measures stressed in the design and operation of this plant. Sanitation, freedom from dust, and the comfort of the employees were also taken into consideration. Large steel-sash windows give ample light for all operations and dust-collectors are installed in every department where dust is created. As a result the plant is a credit to the Alpha Portland Cement Co. and to the cement industry as a whole and has become a show place for cement men of every nation, as well as others who visit the plant in large numbers every year.

The plant was built by the Phoenix Portland Cement Corp. and went into operation in March, 1927. Lindley C. Morton, president of that company, was responsible for the general design of the plant and was assisted by the engineering department of the company, which included H. O. Underhill, who is superintendent of the plant and superintended its construction. A careful study of the best modern practices and trends in American and European plants was made and is largely responsible for the sound design. The kilns, which were at that time the largest in existence, started the trend toward the long and efficient kilns which are now replacing the old short kilns. Simplification of the plant's design through the use of larger and more efficient units in other parts of the plant was another result of this study. This and the grouping of these machines resulted in a considerable saving in man-hours. The grouping of the raw- and finish-grinding departments and the power-house is an example.

The plant was taken over by the Alpha Portland Cement Co. on May 1, 1928, and now forms an important link in the chain of ten plants operated by the company in the South, Middle West and East.

The company acted as general contractor for the entire plant and sublet various parts of the work. The slurry and cement silos were built by the Burrell Engineering and Construction Co. and the kiln stack by the Rust Engineering Co. F. L. Smidth & Co. designed the kiln department. All the electrical equipment, with the exception of a few odd motors, was furnished by the General Electric Co. All bucket-elevators, screw-conveyors, belt-conveyors and their drive gears were furnished by the Link-Belt Co.

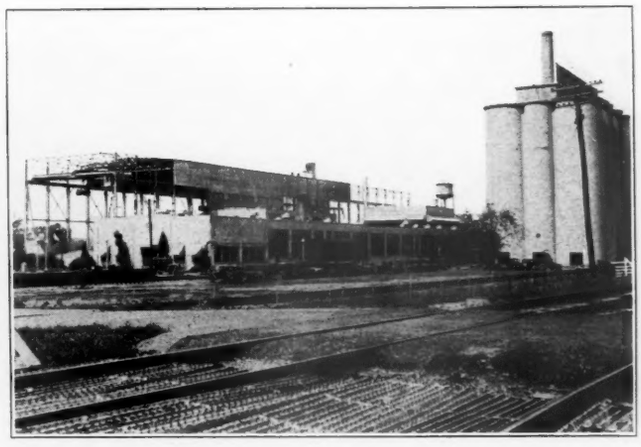
Limestone Quarrying and Crushing.—The limestone in the quarry is in the Conosauga formation of the Cambrian system. Like all the other deposits in the vicinity of Birmingham it is folded and dips to the south, at an angle of about 45 deg. Before quarrying was begun on this property it was thoroughly diamond-core drilled to a depth of 200 ft. Enough stone was developed to keep the plant in full operation for 100 yr. or more.

The following are typical analyses of the stone:

	High	*Low*
SiO_2	5.56 per cent.	10.26 per cent.
R_2O_3	2.66 per cent.	3.80 per cent.
CaO	48.12 per cent.	44.78 per cent.
MgO	2.84 per cent.	3.16 per cent.
Loss on Ignition	40.99 per cent.	37.59 per cent.
	100.17 per cent.	99.59 per cent.

The overburden in the quarry is clay, averaging 3 ft. in thickness. Stripping is done by contract every 3 or 4 yr., the overburden being removed considerably ahead of the quarry operations. The quarry is now about 400 ft. wide and 600 ft. long and varies from 70 to 77 ft. in depth. Because of the steep inclination of the rock strata the quarry was opened in an unusual manner. Instead of making a large bottom shot and enlarging in all directions, a strip about 400 ft. long, 40 ft. wide and 30 ft. deep was first shot out. After this stone was removed this level was widened to about 200 ft. Another 15-ft. level was then taken out and the quarry enlarged to its present dimensions. Another level of 30 ft. was then started and is now about two-thirds completed. When this level is worked out the quarry will be further extended to the west away from the plant.

Kiln stack seen between mill building (left) and shops (right).



Plant from southwest, with storage building and office at left.

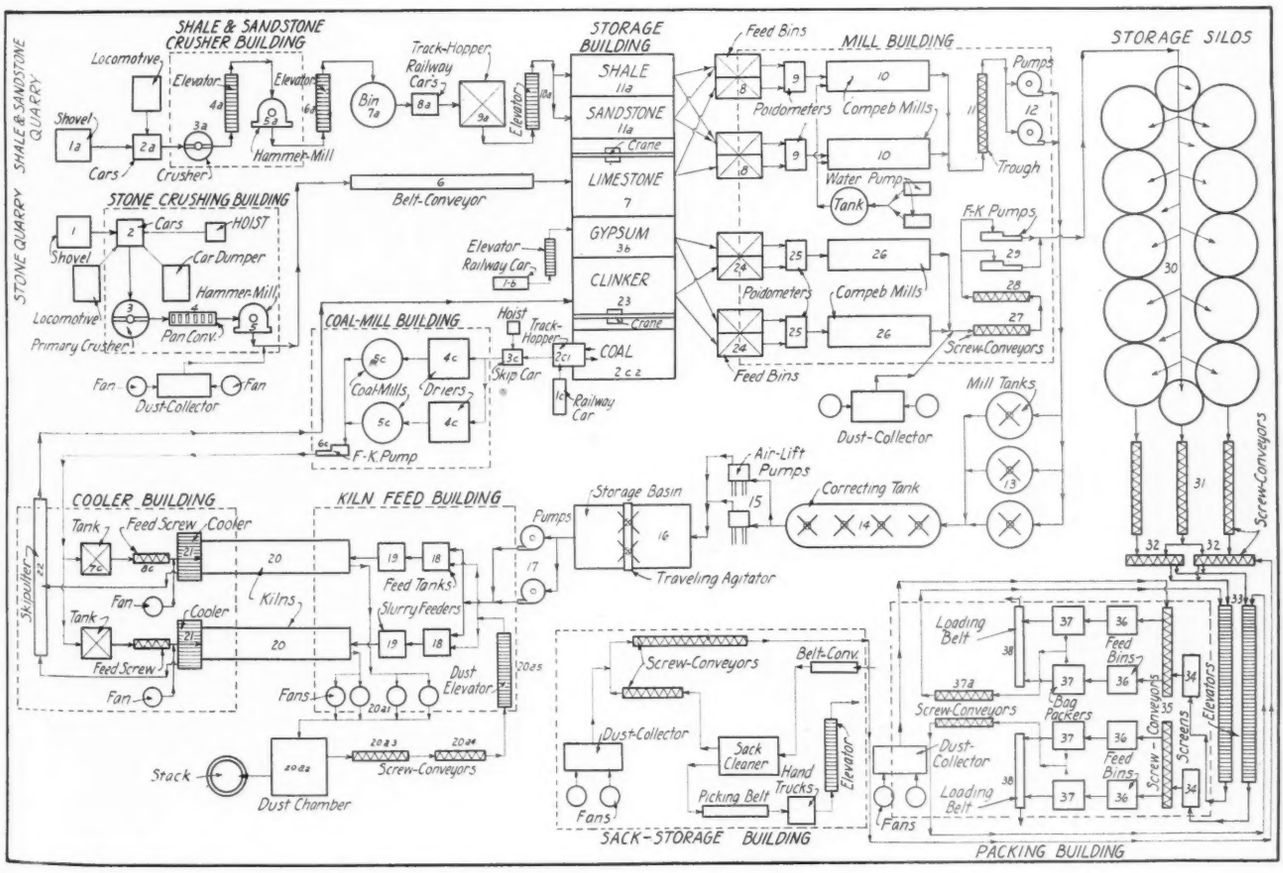
TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE ALPHA PORTLAND CEMENT CO., PHOENIXVILLE, ALA.
(Key numbers refer to corresponding numbers on accompanying flow-sheet)

Operation		Key	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Limestone	Loading	1	Shovel	Bucyrus	100B, electric, 2½-cu. yd.		
	Transportation to crusher	2	Cars Locomotives (2) Hoist Car-dumper	Easton General Electric Steward Mfg. Co. Steward Mfg. Co.	6-cu. yd. Phoenix 9-ton Storage-battery Single-drum Rotary	225-hp. 300-r.p.m. G. E. 10-hp. G. E. motor	Gear Falk herringbone reducer
	Primary crushing	3 4	Primary crusher Apron-conveyor	Allis-Chalmers Link-Belt	42-in. Superior McCully 48-in.	200-hp. G. E. motor 15-hp. G. E. motor	Belt Falk herringbone reducer
	Secondary crushing	5 6	Hammer-mill Belt-conveyor (To 7)	Williams Link-Belt	No. 9 Jumbo 30-in., 330-ft. centers	380-hp. G. E. motor 30-hp. G. E. motor	Direct Falk herringbone reducer
Shale and Sandstone	Loading	1a	Shovels (2)	Bucyrus	20 B, electric		
	Transportation to crusher	2a	Cars Locomotive	Sanford Day Vulcan	5-cu. yd. bottom-dump 7-ton gasoline		
	Primary crushing	3a 4a	Primary crusher Bucket-elevator	Allis-Chalmers Link-Belt	20-in. McCully 32-in. belt, 20-ft. centers	60-hp. 900-r.p.m. G. E. slip-ring motor 15-hp. G. E. motor	Belt Falk herringbone reducer
	Secondary crushing	5a 6a	Hammer-mill Bucket-elevator	Williams Link-Belt	No. 5 Jumbo Chain 16-in. by 50-ft.	150-hp., 1200-r.p.m. G. E. slip-ring motor 15-hp. G. E. motor	Direct Falk herringbone reducer
	Storage and transportation to plant	7a 8a 9a 10a	Bin Railway cars Track hopper Bucket-elevator (To 11a)	 Link-Belt	100-ton circular, steel Bottom-dump 12-ft. sq. Chain 16-in. by 43-ft.	 15-hp. G. E. motor	 Falk herringbone reducer
Gypsum	Receipt and handling	1b 2b	Railway cars Bucket-elevator (To 3b)	 Link-Belt	 Chain 16-in. by 26-ft.	 10-hp. G. E. motor	 Falk herringbone reducer
Raw-material grinding		 8 9 10	(From 7 and 11a) Feed-bins (2) Poidometers (2) Mills (2)	 Schaffer Allis-Chalmers	 20-ft. by 25-ft. 7-ft. by 8-ft. by 40-ft., Compebs	 800-hp. G. E. synchronous motors	 72-in. Cutler-Hammer magnetic clutches
Slurry blending and feeding		11 12 13 14 15 16 17 18 19	Agitator trough Pumps (2) Mll tanks (3) Agitators (3) Correcting tank Agitators (4) Air-lift pumps (2) Storage-basin Traveling agitator Pumps (2) Kiln-feed tanks Slurry-feeders	Wilfley F. L. Smidth F. L. Smidth F. L. Smidth F. L. Smidth Wilfley F. L. Smidth	Ribbon agitator 4-in. centrifugal 700-bbl. each, concrete Mechanical and air 2100-bbl. concrete Mechanical and air 4-ft. 12,000-bbl. concrete Mechanical and air 4-in. centrifugal Steel Scoop	10-hp. G. E. motor 30-hp., 1200-r.p.m. G. E. 30-hp. G. E. motor for all 30-hp. G. E. motor for all Air { 5-hp. motor { 10-hp. motor 30-hp. G. E. motor Kiln girth-gear	Falk herringbone reducer Direct Falk herringbone reducer Falk herringbone reducer Cleveland speed-reducer Foote Bros. speed-reducer Direct Chain
Clinker burning and cooling		20 21 22	Kilns (2) (Dust-laden air to 20a) Coolers (2) Shaker conveyor (To 23)	Traylor F. L. Smidth F. L. Smidth	343-ft. 9-in. by 10-ft. by 11-ft. 3-in. Unax, double-cylinder 14-in. Skipulter	100-hp. G. E. d.-c. motor Kiln 15-hp. G. E. motor	Falk speed-reducer and gears Double-belt
Kiln building		$20a_1$ $20a_2$ $20a_3$ $20a_4$ $20a_5$	Draft fans (4) Dust-chamber Screw-conveyor Screw-conveyor Bucket-elevator (To 18) Stack	Buffalo Forge Co. Link-Belt Link-Belt Link-Belt Rust Eng. Co.	Duplex conoidal, size 11 12-in., 59-ft. centers 293-ft., 20-ft. ins. diam.	40-hp. G. E. motor 5-hp. G. E. motor 10-hp. G. E. motor 15-hp. G. E. motor	Direct Falk speed-reducer Falk speed-reducer Falk speed-reducer
Finished-material-grinding		 24 25 26	(From 3b and 23) Hoppers (2) Poidometers (2) Mills (2)	 Schaffer Allis-Chalmers	 20-ft. by 25-ft. 7-ft. by 8-ft. by 40-ft., Compeb	 800-hp. G. E. synchronous motors	 72-in. Cutler-Hammer magnetic clutches
Cement storage		27 28 29 30	Screw-conveyor Screw-conveyor Pumps (2) Storage-silos	Link-Belt Link-Belt Fuller-Kinyon Burrel	14-in. 14-in. 6-in. 150,000-bbl., concrete	5-hp. G. E. motor 5-hp. G. E. motor 75-hp. G. E. motor	Cleveland speed-reducer Cleveland speed-reducer Direct
Packing and shipping		31 32 33 34 35 36 37 37a 38	Screw-conveyors (3) Screw-conveyors (2) Elevators (2) Screens Screw-conveyors (2) Bins (4) Packers (4) Screw-conveyors (2) Belt-conveyors (2) (To 32)	Link-Belt Link-Belt Link-Belt Link-Belt Bates Link-Belt Link-Belt	 Chain, 51-ft. centers 3-tube 	30-hp. G. E. motors 10-hp. G. E. motors 30-hp. G. E. motors 15-hp. motors 10-hp. motors 	Falk speed-reducers Cleveland speed-reducers Direct Falk speed-reducer and chain Chain-driven from above
Sack-handling and cleaning			Belt-conveyor Sack-cleaner (Dust to screw-conveyors) Picking conveyor Screw-conveyor Screw-conveyor Bag elevator (Bags to 36)	 Nazareth Link-Belt Link-Belt 	30-in. Nazco 40-ft. centers 9-in. by 200-ft. 	20-hp. G. E. motor Same as above 5-hp. G. E. motor 10-hp. G. E. motor 5-hp. G. E. motor	Falk speed-reducer and gear Same as above Foote speed-reducer Falk speed-reducer Falk speed-reducer
Coal handling, pulverizing and feeding		1c $2c_1$ 3c 4c 5c 6c 7c 8c	Railway cars Track hopper (To $2c_2$ or 3c) Skip car Driers (2) Mills (2) Pump Hoppers (2) Feed-screws (2) Fans (2) (To 20)	 Bartlett & Snow Fuller-Randolph Fuller-Lehigh Fuller-Kinyon Buffalo Forge Co.	 60-cu. ft. Vertical 46-in. 6-in., Type E 10-ft. by 15-ft. 6-in., double-flight Conoidal	 15-7½-hp. hoist 100-hp. G. E. motors 20-hp. G. E. motor 5-hp. d.-c. motors	 Direct Direct Falk speed-reducer

(*Continued on next page*)

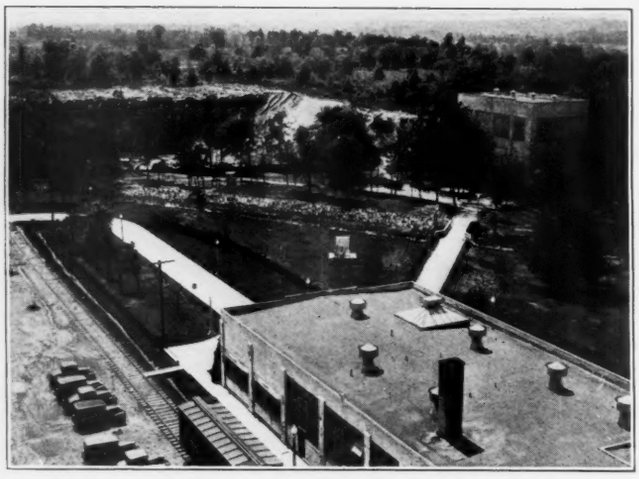
TABULAR ANALYSIS OF THE OPERATIO SNAND EQUIPMENT OF THE ALPHA PORTLAND CEMENT CO., PHOENIXVILLE, ALA. (Cont.)

Operation		Key	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Storage building		7	(From 6) Limestone (To 8) (From 10a) Shale & sandstone (To 8) (From 2b) Gypsum (To 24) (From 22) Clinker (To 24) (From 2c) Coal (To 3c) Overhead cranes (2) Clam-shell buckets (2)	Whiting Blaw-Knox	80-ft. by 460-ft. 2½-cu. yd.		
Dust-Collection	Stone-crushing building		Dust-collector	Norblo			
	Mill building		Dust-collector	Norblo			
	Packing building		Dust-collector	Norblo		10-hp. motor	Falk speed-reducer and chain
	Sack-storage building		Dust-collector	Norblo			
	Coal building		Fans (2) Cyclones (2)	Buffalo Forge Co.	No. 10 8-ft.	40-hp. G. E. motor	Direct
Compressed-Air Supply	Shale-crushing building		Air-compressor	Sullivan	12-in. by 10-in.	60-hp. G. E. motor	Direct
	Slurry basin		Air-compressor	Ingersoll-Rand	Type XRB, 7-in. by 10-in. by 10-in.	40-hp. G. E. motor	Direct
	Mill building		Air-compressor Air-compressor	Ingersoll-Rand Ingersoll-Rand	18-in. by 11-in. by 14-in. 15-in. by 9½-in. by 12-in.	175-hp. G. E. motor 125-hp. G. E. motor	Direct Direct
Miscellaneous Supply Sources	Emergency kiln-power		Auxiliary engine (drives one generator set in emergencies) Motor-generator sets (2)	Sterling G. E.	Gasoline, 240-hp. 435-hp.		
	Water		Pumps Water-tank	Goulds Triplex	8-in. by 10-in. Steel	20-hp. G. E. motor	Direct



Flow-sheet of the operations of the Alpha plant at Phoenixville.

Drilling is done by two Loomis Clipper electric well-drills fitted with 6-in. Gill bits. Each of these tools drills an average of 35 ft. per 10-hr. day. Holes are drilled with a 20-ft. burden and on 15-ft. centers in a single row. They are loaded with about 4½ cases of Du Pont 75-per cent. gelatin in the bottom of the hole and ½ case of Gelex A 15 ft. from the top. Cordeau-Bickford safety fuse is used for all shots. Using this system gives very good fragmentation as the stone breaks itself in falling. The average blast uses about 3 tons of explosive and releases on the average 3½ tons of rock to the lb. Very little secondary shooting is necessary. The secondary drilling is done by one man with Ingersoll-Rand Jackhamers. Less than 500 lb. of



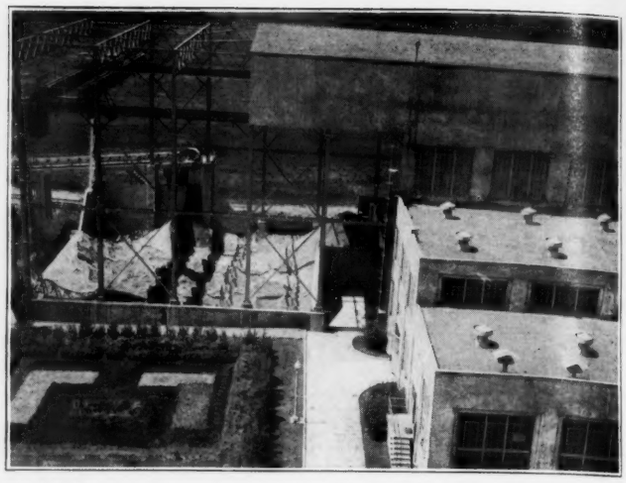
Looking over shops from top of storage silos toward quarry and crusher-house.

explosive is used per month for secondary shooting.

The quarry is drained to a sump in one corner of the quarry near the plant. A 6-in. centrifugal pump, driven by a 30-hp. motor and running 1 hr. a day, is large enough to remove all the water accumulating under normal conditions. A 10-in. Goulds centrifugal pump is kept in reserve for use in an emergency and during the rainy season.

The rock is loaded by a Bucyrus Type 100B electric shovel fitted with a 2½-cu. yd. dipper and Ward-Leonard control. This size of shovel is

Quarry and crusher building from the southwest.



Looking down on mill building and raw-material storage.

usually equipped with a 4-cu. yd. dipper but, for the conditions existing here, the use of a smaller dipper was calculated to be more economical over a long period of time. The low maintenance and repair costs in the 5 yr. the shovel has been in operation have fully justified this assumption. The shovel loads trains of 3 Easton 6-cu. yd. Phoenix-type quarry cars which are drawn by a 9-ton G. E. storage-battery locomotive to the foot of the incline leading to the plant. Two cars of stone are ample to keep the crushing plant operating at capacity

Loading shale at quarry. Crushing plant in background.

while the other two cars are being loaded and hauled to the incline. A second electric locomotive is kept in reserve.

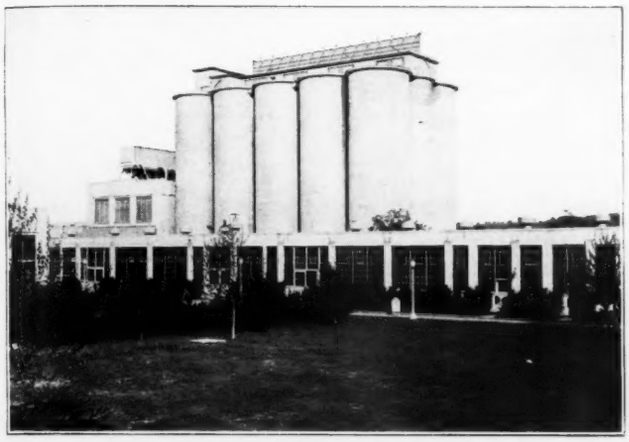
The cars of limestone are drawn up the quarry incline one at a time by a Steward Mfg. Co. single-drum hoist. This spots the car in a Steward rotary car-dumper which empties its contents into the primary crusher. The car-dumper is controlled by a single lever which releases the brake when the power is turned on and *vice versa.*

The 42-in. Allis-Chalmers Superior McCully gyratory primary crusher discharges to a 48-in. Link-Belt inclined apron-conveyor which feeds a Williams No. 9 Jumbo hammer-mill. This discharges on a 30-in. inclined belt-conveyor which operates on 330-ft. centers and has its tail end in

a concrete pit under the mill. This conveyor reaches ground-level at a point outside the crusher building and is then supported for the remainder of its length on a concrete trestle. It discharges through a spout into the raw-material and clinker storage, where the stone is rehandled by an overhead traveling crane. Manhattan Rubber Co. belting is used on this conveyor.

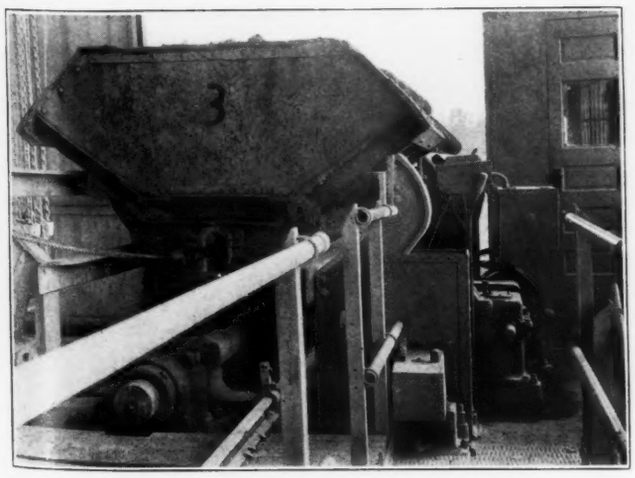
A Norblo dust-collecting system in the crusher building keeps it practically dustless. The dust collected is discharged from time to time to the main belt-conveyor leading to storage. Two Yale & Towne electric hoists over the crusher floor are used to handle repairs or replacements.

Shale and Sandstone.—The shale and sandstone required for making a cement mix are obtained from a single quarry at Lewisburg, which is north-

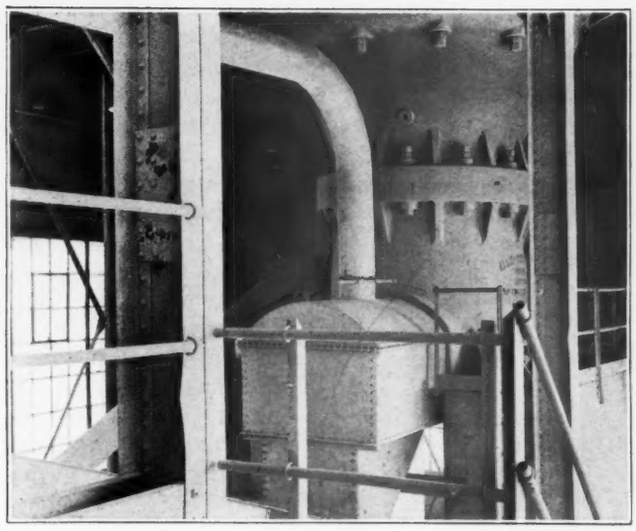


Cement-storage silos and pack-house with shops in foreground.

east of the cement plant and 16 mi. distant by rail. These deposits were also prospected before quarrying was begun so that it is possible to select the materials from parts of the quarry to correspond with the stone being quarried at the plant. Less than 10 per cent. of the shale and sandstone is usually required to balance the lime, silica, iron and alumina contents. About twice as much sandstone as shale is used. Analyses of the sandstone and shale made up from averaged tests of many pros-



Car and dumping mechanism in the crusher building.



Gyratory primary crusher with connection to dust-collector.

pect holes which were drilled at the deposit follow:

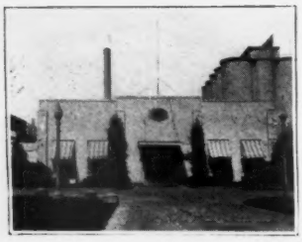
	Sandstone	*Shale*
SiO_2	87.04 per cent.	58.60 per cent.
Al_2O_3	5.16 per cent.	21.80 per cent.
Fe_2O_3	3.94 per cent.	5.92 per cent.
CaO	0.20 per cent.	0.50 per cent.
MgO	0.71 per cent.	1.97 per cent.
Loss on Ignition	1.47 per cent.	7.63 per cent.
Undetermined	.....	3.58 per cent.
	98.52 per cent.	100.00 per cent.

These materials are drilled with Ingersoll-Rand

Sack cleaner, picking and feed conveyors. Note connections to dust-collector.

tripod drills and Jackhamers. The shale and sandstone are worked from separate faces several hundred feet apart. Only one of them is handled at a time, using the same plant equipment, as there is ample storage at the cement plant to handle a day's output of either material.

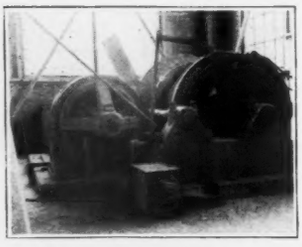
Very little blasting is necessary for either of these materials. A Sullivan 12-in. by 10-in. air-compressor, belt-driven by a 60-hp. G. E. motor, furnishes air for drilling. A Bucyrus 20B shovel loads a train of 3 Sanford-Day 5-cu. yd. bottom-dump cars. These are hauled by a 7-ton Vulcan gasoline locomotive a distance of several hundred



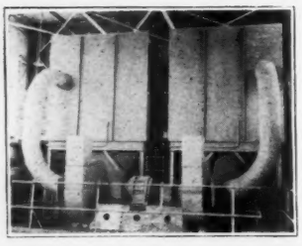
The plant office.

One of the well drills.

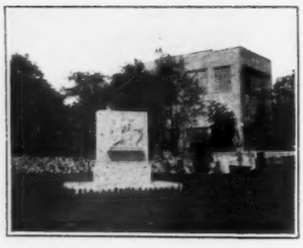
Part of chemical laboratory.



Hoist in crusher-house.



Crusher dust-collector.



The safety trophy.

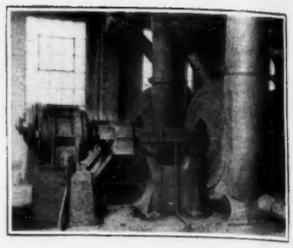
feet to the plant to a trestle from which they are dumped to the 20-in. Allis-Chalmers McCully No. 9 gyratory primary crusher. This discharges to a 32-in. belt-bucket-elevator which operates on 20-ft. centers and feeds a Williams No. 2 Jumbo hammer-mill. This discharges to a steel-inclosed 16-in. chain-bucket-elevator which is set on 50-ft. centers and discharges to a 100-ton circular steel storage-bin. From the bin the material is discharged through two arc gates into regulation bottom-dump railway cars on a siding below the bin. This siding connects to the Sloss-Sheffield Steel & Iron Co.'s industrial railway which hauls coal from its Lewisburg mines to its by-product and coke plant. As both the shale-and-sandstone quarry and the cement plant are within the switching limits of Birmingham, the hauling is done by the railroad for a reasonable switching charge.

At the cement plant the shale and sandstone are dumped into a 12-ft. square track hopper. A 16-in. chain-bucket-elevator operating on 43-ft. centers discharges to the raw-material storage-building, where the shale and sandstone are rehandled to individual storage compartments.

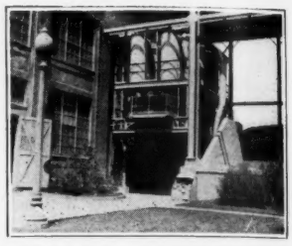
Raw Material Storage and Grinding.—The raw-material and clinker storage-building is 460 ft. long and 80 ft. wide. It is divided by concrete partitions into storage sections for limestone, sandstone, shale, gypsum, clinker and coal. All these materials are handled by two Whiting 10-ton overhead traveling cranes equipped with 2½-cu. yd. Blaw-Knox clam-shell buckets. One crane handles the raw materials and the other coal and clinker, but in case one should break down the other can substitute for it. The limestone section is 90 ft. long and each of the sections for shale and sandstone 25 ft. long.

The raw materials are fed from storage by one of the cranes to the two 20-ft. by 25-ft. steel feed hoppers of the two raw-grinding mills. Each of these hoppers is partitioned to store limestone on one side and shale and sandstone on the other. Two Schaffer poidometers feed from these hoppers to the two 7-ft. by 8-ft. by 40-ft. Allis-Chalmers raw-grinding Compeb mills. The first compartment of each of these mills is 9 ft. long and 8 ft. in diameter and is loaded with 4-in. forged-steel balls. The second and third compartments of the mill are 7 ft. in diameter and are loaded with 2-in. forged-steel balls and ¾-in. steel balls, respectively. The two finish-grinding Compeb mills are also located in this building alongside the raw-grinding mills and are similar in size. Each of the mills is driven by an 800-hp. synchronous motor through a 72-in. Cutler-Hammer magnetic clutch and a Falk flexible coupling. The raw-grinding mills run at a speed of 20 r.p.m. and produce 100 bbl. per hr. of slurry, ground to a fineness of about 90 per cent. through 200-mesh.

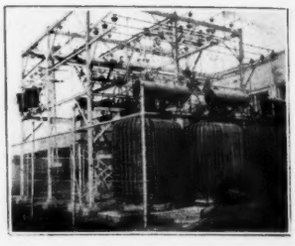
The raw- and finish-grinding departments and the power-house have been combined in one roomy well-lighted building. This arrangement has resulted in a considerable saving in man-hours as three men control all operations in these departments. A Norblo dust-collector keeps this building dustless and allows open switches, air-compressors and generators in the same room with the mills.



Coal-drier fans.

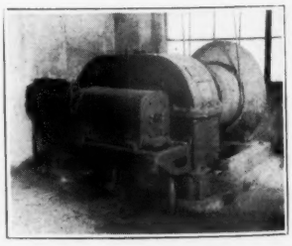


Mill-bldg. dust-collector.

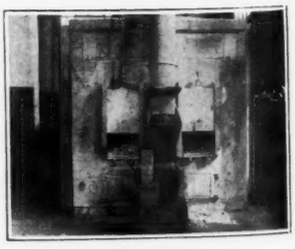


Outdoor substation.

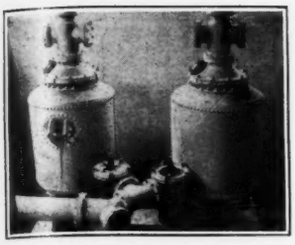
Kiln-coal feeder and fan.



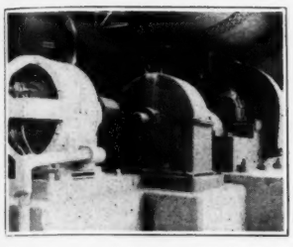
Coal skip-hoist.



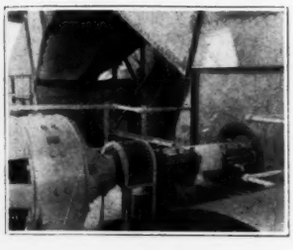
Furnace in coal-house.



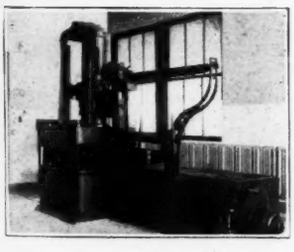
Air-lift slurry pumps.



One of the kiln drives.



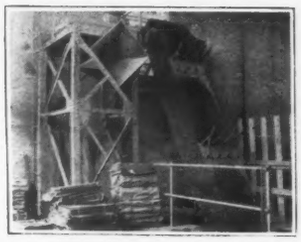
Kiln draft fans.



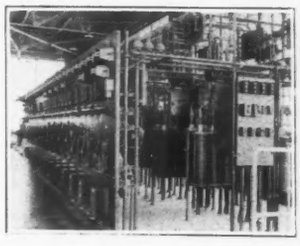
Compression-test machine.

Slurry Agitation.—The slurry discharged from these mills has a moisture content of from 34 to 35 per cent. It is fed to a trough which has a ribbon agitator. This feeds two 4-in. Wilfley pumps, only one of which is used at a time. The slurry is pumped to three concrete mill tanks, each of which is 20 ft. in diameter and 20 ft. high and has a capacity of 700 bbl. These tanks are supported on concrete columns above ground-level, the space beneath them being used for storing miscellaneous equipment. They discharge by gravity to a 2,100-bbl. correcting basin, the bottom of which is considerably below ground-level. Two F. L. Smidth air-lift pumps, set in a concrete pit under the mill tanks, pump the slurry from the correcting basin to the main slurry-storage tank. Air for these pumps is furnished by an Ingersoll-Rand Type XRB 7-in. by 10-in. by 10-in. air-compressor driven by a 40-hp. motor. Each of the three mill tanks is fitted with a Smidth mechanical agitator, all three being operated from a single shaft driven through a Falk herringbone-gear speed-reducer by a 30-hp. motor. The correcting basin has four of these agitators, which are driven by a single 30-hp. motor through a Falk speed-reducer. The circular ends of this basin insure efficient agitation.

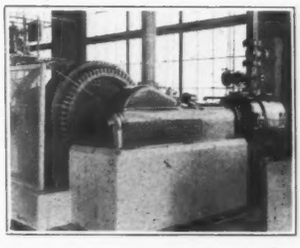
The storage-basin is of a type which was comparatively new to the cement industry at the time the plant was built but which has since become increasingly popular among wet-process plants. It is of reinforced-concrete construction, is 200 ft. long, 25 ft. wide and 21 ft. deep, and has a capacity of 12,000 bbl. of slurry. An F. L. Smidth traveling agitator having two revolving paddles spans the basin and travels back and forth along its length, insuring a final thorough mixing of the slurry and keeping the solid particles in suspension. A 10-hp. motor drives both paddles through a Foote Bros. speed-reducer, and a 5-hp. motor, connected through a Cleveland speed-reducer, moves the agitator back and forth on the top of the basin. Air released from the bottom of the paddles assists in the agita-



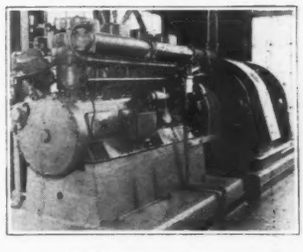
Bag-house elevator.



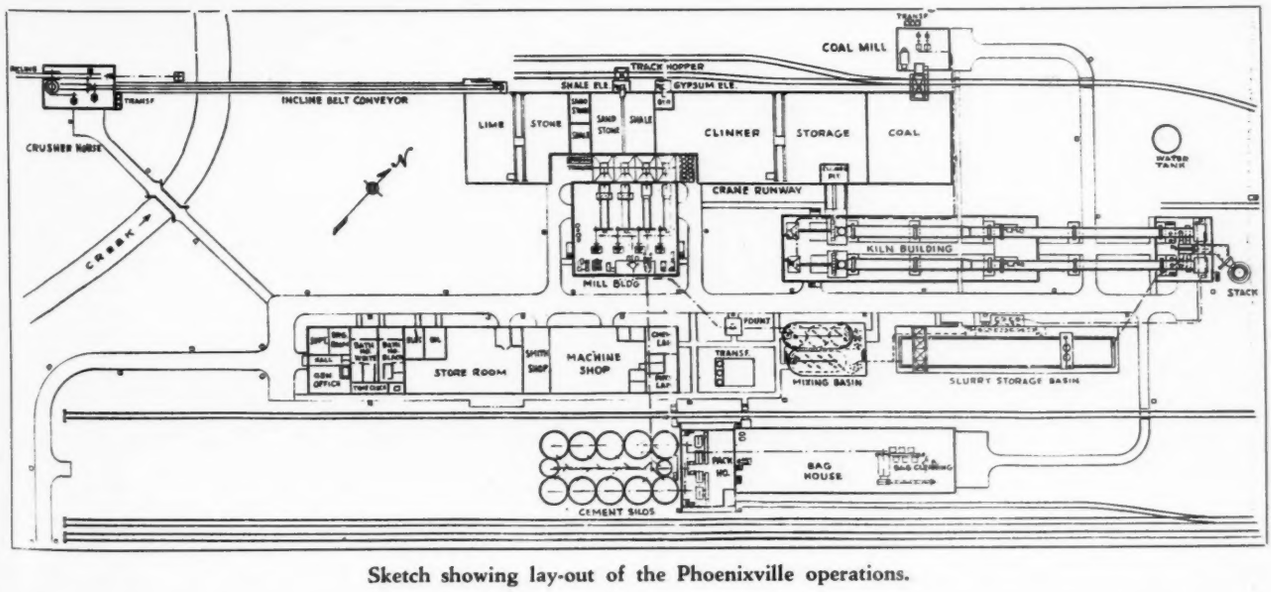
Switchboard in mill-room.



Compressor in mill-room.

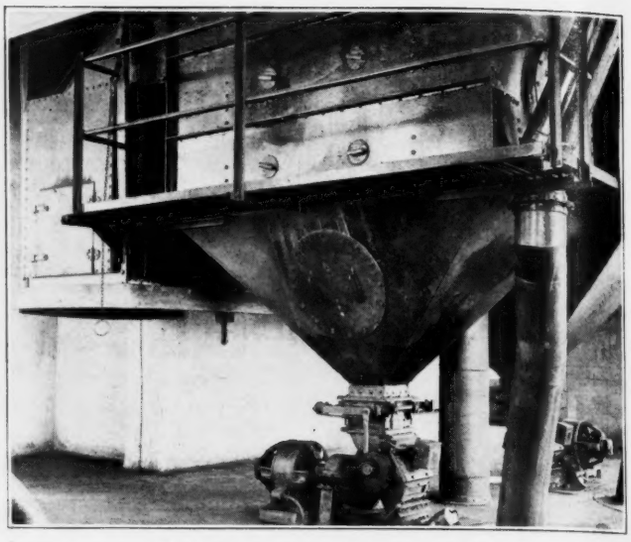


Auxiliary generator.



Sketch showing lay-out of the Phoenixville operations.

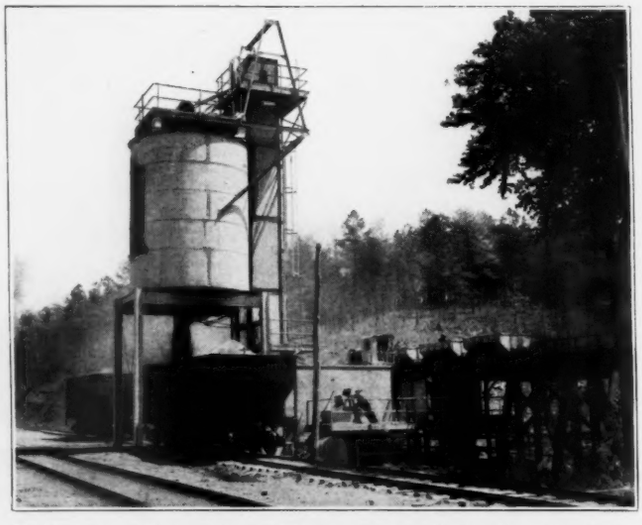
Hammer-mill and motor in crusher building.



Feeders from coal driers to mills.

tion, and an air-pipe in each corner of the basin agitates the slurry which the paddles can not reach.

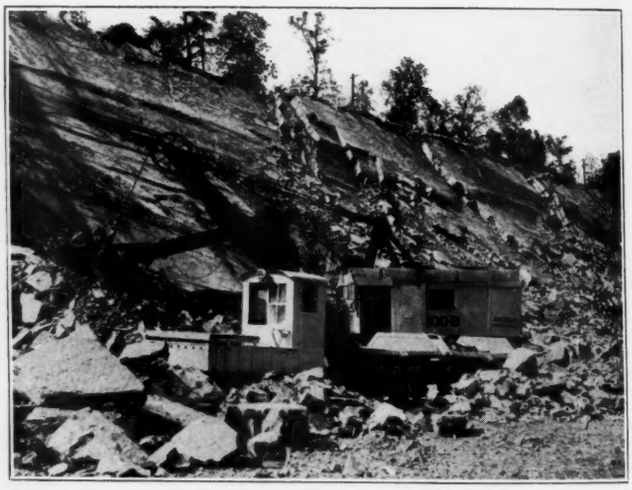
Two 4-in. Wilfley pumps, only one of which is used at a time, feed the slurry from this basin to a double steel kiln-feed tank over the feed end of the kiln, an overflow pipe returning excess slurry to the basin. The slurry feeders in these tanks were originally driven through direct-current motors connected through speed-reducers, and the speeds of the motors were controlled by generators on the high-speed shafts of the kiln-drive motors. This method has since been abandoned and the feeders are now chain-driven from girth sprockets



Shale-and-sandstone plant with quarry cars discharging to primary crusher and railway cars being loaded.

around the kilns. This keeps the speeds of the kilns and feeders in direct proportion and the rate of slurry feed is altered by adding or removing buckets from the feeders. Merco-Nordstrom slurry valves are used exclusively on the slurry lines.

Kilns and Coolers.—Each of the two rotary kilns is 343 ft. 9 in. long but has an effective burning length of only 330 ft. because of the Smidth Unax coolers at its discharge end. Each kiln is 11 ft. 3 in. in diameter for 120 ft. at the discharge end and 10 ft. in diameter for the remainder of its length. Each kiln is driven by a 75-100 hp. direct-current motor through a Falk speed-reducer and inclosed cut-steel gears and is mounted on five single-roll supports. A thrust ring, between two beveled disks at the center of the kiln, distributes the expansion



Electric shovel loading stone in cars. Note storage-battery locomotive.

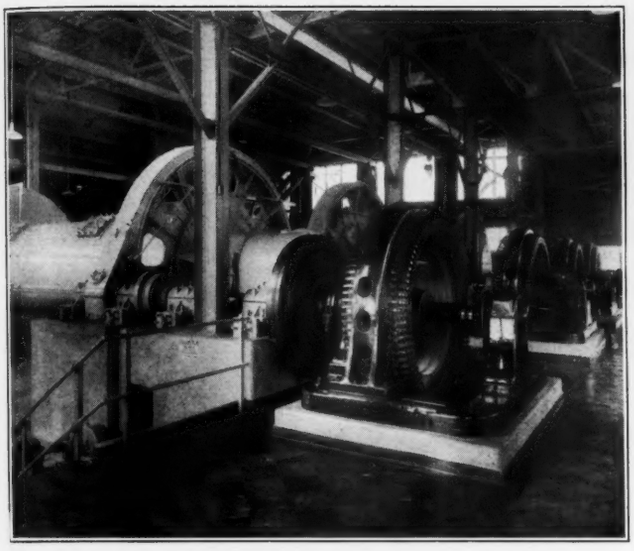
of the kiln equally to both ends. At present the kilns are being run at about 55 r.p.hr. They were made by the Traylor Engineering and Mfg. Co. to the specifications of F. L. Smidth & Co.

Each kiln has a Smidth chain system suspended for the first 64 ft. of its length. This not only agitates the slurry and breaks up lumps but also transfers the heat more effectively to the slurry, giving a better fuel rate. These chains also collect some of the dust which would otherwise be lost. The small amount of dust getting through to the flue chamber and the low exit-gas temperatures of from 550 to 600 deg. F. attest the advantages of these chains. Three or four brands of high-alumina brick are used to line the kilns.

All the air entering the kiln is drawn in through the coolers and the coal-feed pipes. The coolers preheat the air to a considerable extent and the coal-

feed air is also somewhat preheated as it is drawn through hoods erected over the cooler section of the kiln. Two Buffalo Forge Co. Size 11 duplex conoidal fans induce a uniform draft through each kiln and through a steel dust-chamber and flues leading to the single concrete stack. The best results are obtained by running both fans for each kiln, but one fan can handle all the gases if necessary. The reinforced-concrete stack is 293 ft. high and 20 ft. in inside diameter at the base and has sufficient natural draft to operate the kilns without the fans, should this ever be necessary. Each of the fans is direct-driven by a 40-hp. direct-current motor.

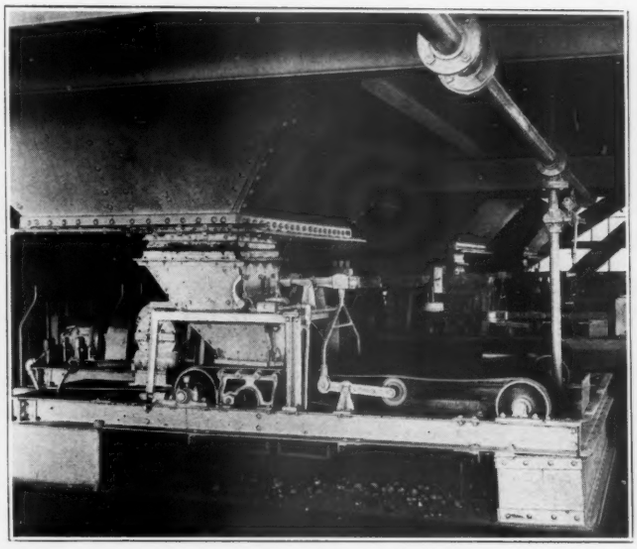
Fresh-air dampers in the smoke-chambers between the kilns and the fans admit enough outside air to lower the gas temperature to a point where it will not damage the fans. An automatic system, designed by F. L. Smidth & Co., controls these dampers so that the gas temperature is kept between 550 and 650 deg. F. Signal lights on the kiln-control board show when this system is working properly.



Battery of three-compartment raw-grinding mills.

Dust precipitated in the dust-chambers and flues is collected by screw-conveyors which feed a 12-in. bucket-elevator operating on 59-ft. centers. The latter discharges by means of a short screw-conveyor to the kiln-feed tank, where dust is added to the slurry in controlled proportions.

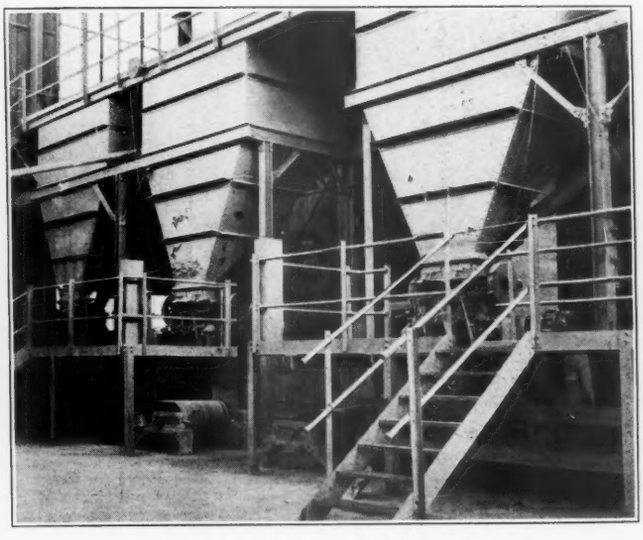
All the controls for the kilns are centralized on a control-board on the burner platform, together with the various indicating instruments. These include push-button switches for all motors, ammeters, speed indicators and revolution counters, draft indicators, temperature-recording potentiometers, etc. Designed for a capacity of 2,000 bbl. per day, the kilns have turned out as much as 2,250 bbl. in one day's run.



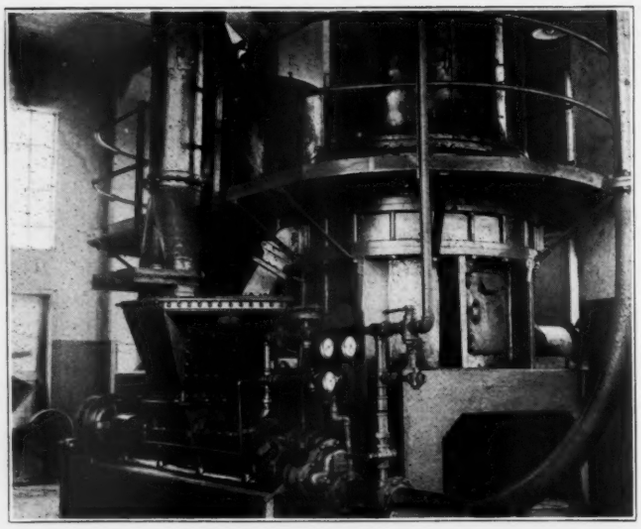
One of the raw-material Poidometers with clinker and gypsum Poidometers in background.

The Smidth Unax coolers were the first of the double-cylinder type to be installed in this country. Each cooler consists of a double row of unlined steel cylinders placed around the discharge end of the kiln. Each cylinder is 3 ft. in diameter and 14 ft. long and has strands of chain suspended in it to transfer the heat from the clinker to the air

Burner at kiln-control board.

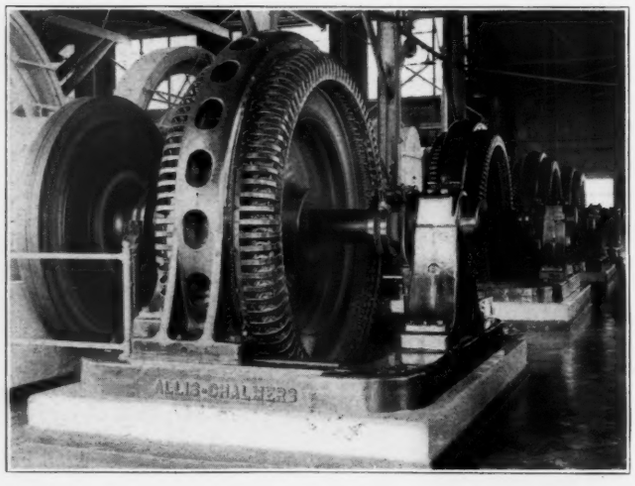


Three of the four three-tube baggers.



The two coal-grinding mills and pump feeding to kiln building.

passing through the cooler to the kiln. Holes in the kiln shell allow the clinker to drop into the lower end of the inner row of cylinders, which are equipped with screw flights that carry the clinker back to the upper end where it drops to the outer row of cylinders for further cooling. The temperature of the clinker is about 400 deg. F. as the latter is discharged to the 14-in. Skipulter reciprocating conveyor, which feeds through the concrete wall of the storage-building into a concrete pit from which the clinker is rehandled to storage or to the finish-grinding mill feed-bins by an overhead crane. A steel stack ventilates the Skipulter tunnel and pit and reduces the clinker temperature to about 200 deg. F. as it leaves the Skipulter.

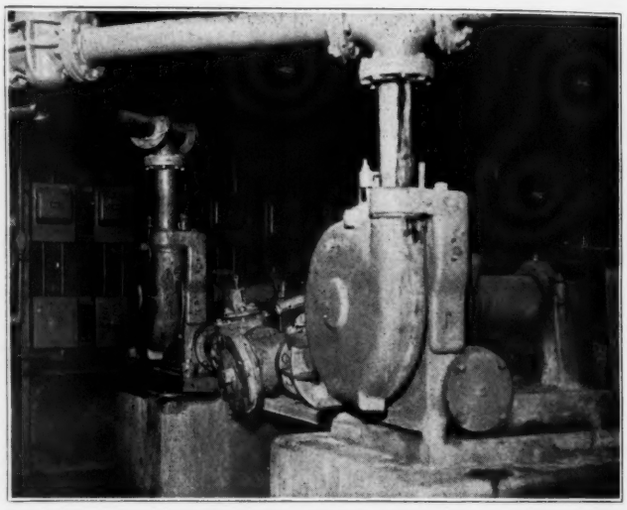


Grinding-mill motors and magnetic clutches.

Finish Grinding and Cement Storage.—Gypsum is shipped to the plant from Texas. Cars are spotted on a siding alongside the storage and are unloaded to a bucket-elevator which runs on 26-ft. centers and feeds the gypsum bin in a corner of the clinker storage.

The clinker and gypsum are handled from the storage-building by one of the overhead cranes to the two 20-ft. by 25-ft. steel finish-grinding mill feed-hoppers which are partitioned to store clinker on one side and gypsum on the other. Two Schaffer Poidometers feed from these bins to the two 7-ft. by 8-ft. by 40-ft. Allis-Chalmers finish-grinding Compeb mills. These are similar in size to the raw-grinding mills, are located in the same building, and use the same grinding media. At the feed end of each mill under the Poidometer floor are three stalls, where the grinding media for each mill are stored.

The finish-grinding mills are driven at the rate of 20 r.p.m. and produce 100 bbl. of cement passing 89 per cent. through 200-mesh. They discharge to a closed trough fitted with a 14-in. screw-conveyor, which empties into a second 14-in. screw which feeds two 6-in. Fuller-Kinyon pumps. One of these is always kept in reserve while the other pumps through a 5-in. line to the cement-storage silos.



Two of the centrifugal slurry pumps.

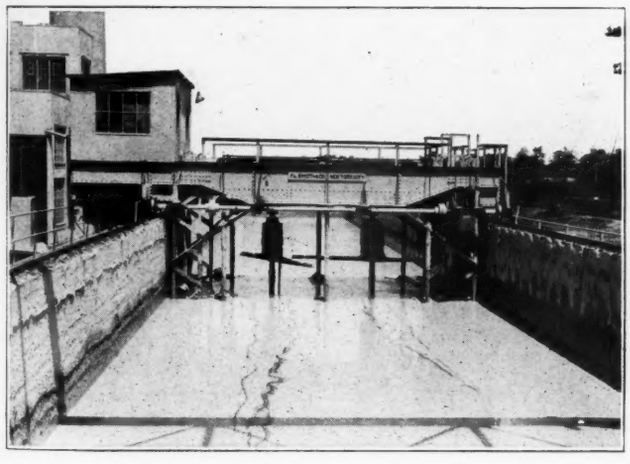
The 10 silos, each 25 ft. in inside diameter, are arranged in two parallel rows of 5 silos each. Unlike the usual silos, these rows are spaced some distance apart and the intervening space is closed by a 16-ft.-diameter silo at each end. The ten silos, together with the large bin thus formed, have a total storage capacity of 150,000 bbl. The silos were built by the Burrell Engineering & Construction Co. A man-lift elevator equipped with Goodrich conveyor belting gives access to the tops of the silos.

Cement is reclaimed from storage by three parallel 18-in. screw-conveyors, two of which are under the rows of silos while the third serves the large bin and the two small silos. These screws discharge to two 18-in. screw-conveyors which are set at right angles to them and discharge to two 18-in. concrete-inclosed chain-bucket-elevators operating on 51-ft. centers. These discharge through screens and thence by screw-conveyors to bins above the four Bates 3-tube valve-bag packers in the pack-house. The spill from the packers is collected by two screw-conveyors, which feed back to the main elevators from the silos. The sacked cement is transferred by two horizontal belt-conveyors, one for each pair of packers, to loading platforms on either side of the building, where it is loaded by hand trucks into cars or motor trucks for shipment. A capstan-type

car-puller is used to spot cars for loading. Two 200-lb. Toledo dial-scales are used for checking sack weights on the packing floor.

A single-story building, 200 ft. long and 60 ft. wide, alongside the pack-house is used for bag storage and repair. It houses a Nazco bag-cleaner which is fed by a 30-in. belt-conveyor. The cleaned sacks are discharged on a 40-ft. horizontal sorting belt. Cloth and paper sacks are trucked to a bag elevator which carries them to the pack-house floor. A megaphone alongside this elevator is used to inform the bag-house employees when more sacks are needed. A short screw-conveyor collects the dust reclaimed by the bag-cleaner and discharges it to a long 9-in. screw-conveyor which feeds it back to the cement elevators. The bag-house also contains sewing machines and other equipment for bag repairs. A Norblo dust-collector on the roof of the bag-house and another over the pack-house keep these buildings dustless.

Coal.—The coal-mill building is a 4-story reinforced-concrete structure located alongside the storage-building near the firing ends of the kilns. Coal is received in bottom-dump railways cars, coming from mines in the vicinity of Birmingham, on a side-track between the storage and the coal-mill building. The cars dump in a track hopper which extends sufficiently far into the coal-storage section of the storage building to enable the overhead crane



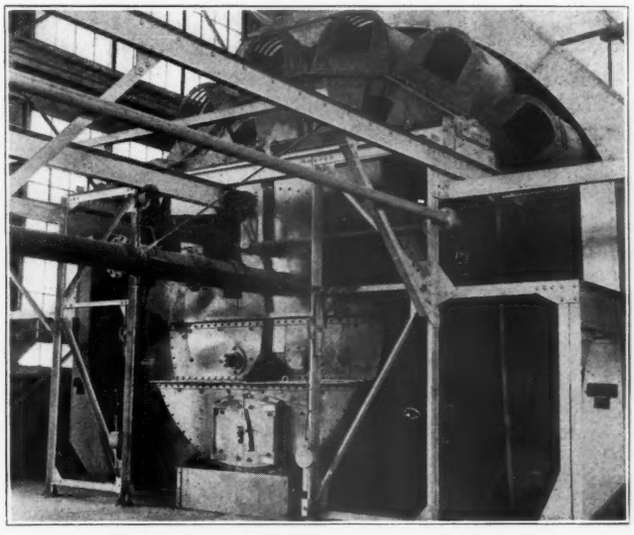
Slurry-storage tank and traveling agitator.

to feed coal to it from storage as conditions may demand.

The track hopper feeds a Bartlett & Snow automatic skip-hoist which has a 2¼-cu. yd. bucket operated by a single-drum hoist. This bucket discharges to two Fuller-Randolph vertical driers, heat for which is furnished by a small furnace fired by a Jones underfeed stoker. Two No. 10 Buffalo fans, driven by 40-hp. motors, circulate the heat through the driers, and two 8-ft. cyclones recover the stack dust. Coal is drawn from the driers by the feeders of the two 46-in. Fuller-Lehigh coal-grinding mills on the ground floor of the building. Three Bristol recording thermometers keep a check on the coal temperatures at the mills and driers.

The coal mills and the cyclones discharge to a 6-in. Fuller-Kinyon Type E pump alongside the mills. This conveys the pulverized coal through a 5-in. pipe-line to the two 10-ft. by 15-ft. steel kiln-feed hoppers in the kiln building. Coal is fed from these hoppers by 6-in. double-flight coal screws to the kiln-feed pipes to which air is furnished by two Buffalo Type R Size 50 conoidal fans, each direct-driven by a direct-current motor. The coal building is as dustless as any other part of the plant. A horn system, operated by the kiln operator, signals for starting or stopping the coal mill.

Control of Quality.—The method of control through the entire plant and quarries is unusually elaborate. The sandstone and shale are first selected



One of the double-cylinder coolers and coal-feed pipe.

to balance the rock being quarried. The first rough mix of the shale and sandstone is made by the crane when these materials are rehandled from storage to the mill-feed bins. These materials are then proportioned with the limestone by the Poidometers which feed the raw-grinding mills. The method being used is to run without sandstone or shale to get a high-lime tank. The second mill tank is then filled with low lime and the third with an approximate cement mix. Two tanks are blended at one time into the correcting basin, where the slurry is sampled and the mix corrected by adding the re-

Looking toward discharge end of kilns and coolers.

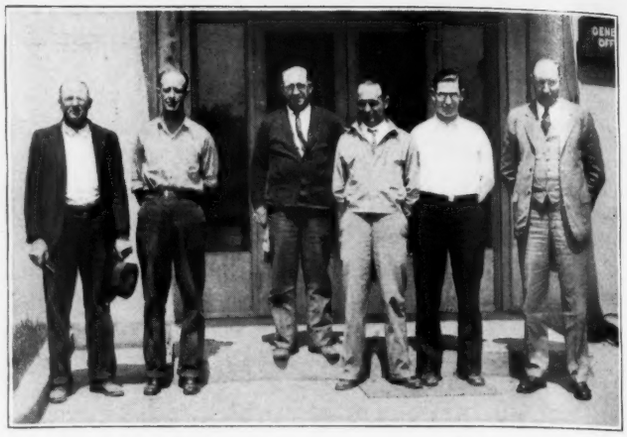
quired material from the tank which contains it.

Samples of the kiln feed are taken every 4 hr. and a daily composite is made of these. This composite is then tested for lime content by the acid-alkali method. A complete analysis of the composite is then made and the lime content determined by the permangante-of-potash method. This is considered the more accurate of the two methods and is used as a check on the acid-alkali method to keep its factor accurate. The clinker is sampled every hour and a daily composite is made. This clinker is tested primarily for soundness and the sulphur content is determined to control the addition of gypsum. An average of 13 lb. of gypsum per bbl. is required to keep the SO_3 content at 1.85 per cent. Hourly samples are taken at the finish-grinding mills and each of these is tested for soundness, fineness, and setting time. Daily composites of these samples are made and are subjected to physical and chemical tests.

Shops and Laboratories.—A single-story building, 346 ft. long and 60 ft. wide, houses the plant offices, laboratories and shops. The offices are at the end toward the entrance to the plant and consist of private offices for the superintendent and a general plant office. In the superintendent's office are a Leeds-Northrup temperature-recording potentiometer, and the kiln and slurry-feeder revolution counters. Adjoining this is a drafting room and then come completely-equipped washrooms, one for white and one for colored employees. Next comes the electrical repair-shop where all electrical repair work is done. Then comes a small oil-storage room and then a 100-ft. general storage-room, which has a large assortment of parts and supplies of all kinds and three long steel racks for small parts, bolts, etc. The storekeeper has an office in a corner of this room. The adjoining blacksmith shop houses an Ingersoll-Rand air-drill sharpener, a Gill well-drill sharpener, two George F. Wheelocks' forges, a 700-lb. pneumatic hammer and a 1-ton Wright chain-hoist mounted on a swinging steel arm which serves these machines.

The machine shop, next in line, is one of the most complete and attractive in the cement industry. The important equipment includes a 26-in. and a 48-in. lathe with a 14-ft. bed; an 18-in. 20-ft. bed lathe; a 12-in. 4-ft. bed lathe; a milling machine; a 24-in. shaper; a radial drill-press; an upright drill-press; a 10-in. chaser; a shear; a sheet roll; and a 300-ton wheel-puller and press. Other equipment includes a double emery wheel, a power hack-saw, a pipe threader, a 3-ton portable crane, a General Electric portable electric-arc welder, and several Oxweld acetylene sets. Like all other parts of the plant, this room is light and airy and its attractiveness is increased by baskets of ferns hanging from the ceiling. As these are high enough to be out of the way, they do not interfere with the work done in the shop. Each unit of equipment has its individual electric-motor drive, a push-button switch on the machine, and an individual Trumbull safety switch.

Part of machine-shop, showing hanging ferns and large windows.



Left to right: P. H. Hunter, quarry foreman; M. H. Floyd, chief electrician; S. D. Youell, general foreman; J. O. Breaux, pack-house foreman; B. H. Adams, chemist; O. H. Underhill, superintendent.

The position of the chemical and physical laboratories at the extreme end of this building puts them within easy reach of the mill room, kiln building, slurry tanks and pack-house where samples must be taken at regular intervals. The physical laboratory is well-equipped to make all the usual tests and compression tests as well. The equipment includes a Riehle 200,000-lb. compression-testing machine, a Tinius-Olsen briquette tensile tester, sieves, balances, etc. Two-in. by 4-in. concrete cylinders are made and tested for the company's own information and other tests are made for users of cement. A series of tests was recently started on concrete cylinders made from the cements in each of the company's eight plants. These tests were made with concrete sand and 1½-in.-minus gravel and each cylinder was tested at 3, 7 and 28 days. A small Chain Belt Co. concrete mixer in the basement of the pack-house was used for mixing the concrete for these cylinders.

The chemical laboratory adjoins the physical laboratory and is also attractively and fully equipped. Table and bench tops are of stone, storage closets, moist closets, etc., are of steel, and wherever possible heating is done by electricity. Both laboratories are well lighted through large steel-sash win-

(*Continued on page 33*)

Theoretical and Practical Developments in Portland-Cement Chemistry

PART III—Theories on Composition of Ingredients Existing in Clinker

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IN Part II a survey was made of the reactions which proceed in cement raw meal on heating. We shall now consider the product of the burning process.

As already mentioned, the first description of a thin section of clinker was given by Le Chatelier in 1887. Le Chatelier's publication remained, however, quite unnoticed until 1897, when a short paper by Törnebohm, in which the observations already made by Le Chatelier were confirmed in all their essentials, appeared. Törnebohm's investigation rapidly became well known, largely because he designated his clinker minerals by the initial letters of the alphabet, coining the words alite, belite, celite, and felite, which are still used. In addition to these four crystalline constituents, he recognized an amorphous melt, which he termed the "glassy ground-mass."

Törnebohm's work was accepted as authoritative for a number of years, and was not appreciably extended until in 1912 von Glasenapp published a new fundamental account of the petrography of Portland-cement clinker. In his lecture before the annual meeting of the Assn. of German Portland Cement Manufacturers he first put forward the view that in the clinker minerals we are most probably not dealing with simple chemical compounds only, but with a continuous range of mixtures of various constituents.

Following this it was shown that even von Glasenapp's system did not take into consideration all the possibilities of mineral formation in clinker. In the succeeding years, therefore, the German investigators Guttmann and Gille took up the problem anew, attacking it first with the object of giving as complete a description as possible of the mineral constituents observed in clinkers of the most varied origin, independent of the question of their individual constitution. Table I gives an abstract from Guttmann and Gille's summary. They distinguish nine clinker constituents, but do not assert that all the nine are necessarily present in every clinker. Generally, only a few of the constituents are found in any individual clinker, so that a great range of materials had to be investigated to ascertain the existence of all nine possibilities.

Calcium aluminates have hitherto seldom been observed in Portland-cement clinker. A possible reason for this is the fact that the high-calcium aluminates (which alone occur in clinker) crystallize regularly, and can therefore be easily confused with free lime and overlooked. Formerly I suggested the view that, in general, free aluminates do not occur in Portland-cement clinker; according to the latest investigations of Guttmann and Gille, however, it appears that the capacity of the aluminates to form mixed crystals or double compounds is less than has hitherto been assumed. It follows, therefore, that in cements high in alumina we are concerned with a not entirely negligible proportion of free aluminates.

Guttmann and Gille use the term epezite to designate a new clinker mineral, first described by themselves and previously generally confused with alite. It consists of certain colorless crystals which from time to time occur in clinker; it is feebly refracting but strongly double refracting, and mostly appears in spherolithic form.

Törnebohm's felite is by most investigators considered to be γ dicalcium silicate. This substance is practically never found except in "dusted" clinker. It is strongly double refracting and shows pronounced striations, which must be closely connected with the cleavage of the crystals longitudinally.

The amorphous glassy ground-mass already described by Törnebohm contains a considerable proportion of alumina. In cements rich in iron this glass may be colored brown by iron oxide, so that

TABLE I.—CONSTITUENTS OF PORTLAND-CEMENT CLINKER (GUTTMANN AND GILLE)

Name	Composition	Color	Refractive Index			Double Refraction	Crystanographic System
			α	β	γ		
Alite	3 CaO . SiO_2 +3 CaO . Al_2O (?)	Colorless	1.715	.....	1.722	Negative	Monoclinic Rhombic
Belite	α or β 2CaO . SiO_2	Brownish	1.715	.....	1.735	Positive	α = Monoclinic
β dicalcium silicate	2 CaO . SiO_2	Colorless	.....	About 1.715	.....	Positive	β = Rhombic Tetragonal
Free lime	CaO	Colorless	.....	1.838	.....	.....	Regular
Celite	Indefinite	Dark brown	.....	.....	.....	.....	.....
Calcium aluminates	3 CaO . Al_2O_3 5 CaO . 3 Al_2O_3	Colorless	.....	1.710 1.608	.....	.....	Regular
Epezite	(?)	Colorless	1.550	.....	1.560	Positive (?)	?
γ dicalcium silicate	2 CaO . SiO_2	Colorless	1.640	1.646	1.655	Negative	Monoclinic
Glass	High Al_2O_3 content	.....	.....	.....	.....	.....	.....

it may be readily confused with the clinker minerals of the celite class.

Such is the outline of the mineralogical structure which, in ever-changing form, we find in Portland-cement clinker. In Fig. 1 is seen a photomicrograph of a thin section of normal clinker, which admirably shows the various constituents. Side by side with the small alite crystals can clearly be observed the belite, consisting of large crystals mostly grouped in ring-formed clusters. This group formation is typical of belite, and seems to indicate that belite is produced in places where the composition of the raw meal varies somewhat from the average. The opaque parts of the photograph consist of celite. This material appears in a number of forms which do not show well in a photographic reproduction. In the same way the many minor constitutents of clinker described above can not be distinguished in a photomicrograph, since the photographic plate does not reproduce with sufficient clarity the delicate effect of the different refractive indices.

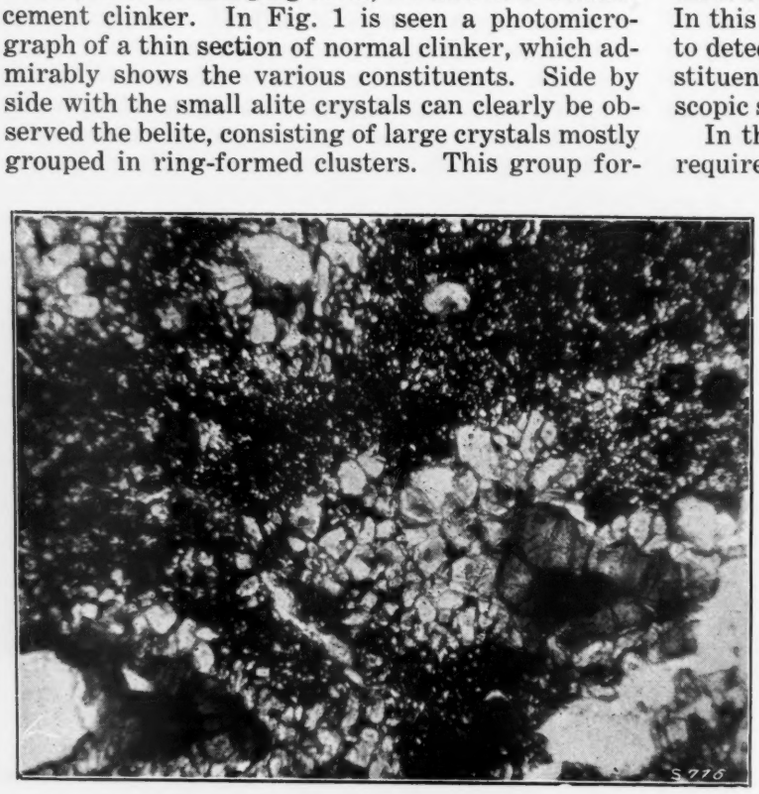


Fig. 1. Thin section of a normal clinker of fairly high belite content.

The wide differences in appearance of which sections of Portland-cement clinker are capable is clearly shown by Figs. 2 and 3. These are photographs of abnormal clinkers, that of Fig. 2 being very rich in iron oxide, and Fig. 3 very poor in that compound. The clinker rich in iron oxide offers a striking contrast. It was prepared a considerable time ago in connection with a synthetic investigation, and consists solely of lime, silica, and iron oxide. The photcgraph shows only two structural constituents, viz., relatively large, well-defined, and transparent crystals embedded in an almost opaque ground-mass. Since the large crystals do not contain alumina, while they are obviously free from iron oxide, it must be concluded from the chemical composition of the clinker that they consist of the much disputed tricalcium silicate. Side by side with these is the dark ground-mass which contains iron in the form of dicalcium ferrite.

While cement rich in iron oxide is distinguished by the vivid contrast of its constituents, the illustration showing a thin section of clinker of low iron oxide content shows an almost total lack of contrast. In this photograph (Fig. 3) it is almost impossible to detect any difference between the individual constituents, although direct observation of the microscopic slide shows a more definite contrast.

In the case of such specimens devoid of detail it requires considerable experience before the various iron-free clinker minerals present can be recognized, and indeed it is generally true that the microscopic investigation of Portland cement is a matter of the greatest difficulty. In addition to the fact that the study of thin sections, with which we are almost solely concerned, presupposes a complete mastery of the polarization microscope and its application, it is only after long practice that the worker can find his way with certainty in the maze of numerous cement constituents.

With these remarks we will leave the mineralogical aspect of Portland-cement clinker in all its varieties, and consider the extent of our present knowledge of the structure of the individual clinker minerals. Most important of all we must inquire into the nature of alite, a controversial question on which much thought and work have been expended. It was long thought that a conclusive solution to this problem would never be found, but recently progress has been made which offers hope of success in the near future. As the question of the nature of alite is the basis of the whole structure of cement chemistry, the various theories around which the controversy has been waged will now be discussed.

The first investigator who endeavored to solve the alite problem was Törnebohm, and it is surprising to note how near he came, even at that early date, to the solution that in all probability must to-day be accepted as correct. Törnebohm explained alite as a solid solution of tricalcium silicate and a high-lime aluminate, although it must be admitted that he put forward a constitution for the aluminate that can not be accepted to-day.

At the beginning of the century Törnebohm's work was eclipsed by that of the Carnegie Institution of Washington. The American investigators considered that it should be possible to apply the laws of equilibrium of heterogeneous systems to the problem of cement. From this assumption they carried out their investigation into the ternary system, which led to the logical conclusion that normal Portland-cement clinker must consist of tricalcium silicate, dicalcium silicate, and tricalcium aluminate. It is true that when an iron-free cement raw mix is fused and allowed slowly to cool the final product is composed of these three constituents. In my opinion, however, it is not permissible to apply these American results for the ternary system to the problem of cement. In the first place cement clinker

can not, on account of the important part played by iron oxide, be considered as a ternary system, but must be regarded as a quaternary system. Then, again, cement clinker is not the result of a process of fusion, but of sintering, a fact which precludes the application of the phase rule and the laws of equilibrium in heterogeneous systems. Although these reasons by no means exhaust the arguments that can be adduced against this American conception of clinker, it is considered unnecessary to go into further detail, as at present it is fairly generally agreed that these ideas can not be accepted.

While the American investigators were still at work in the Carnegie Institution, Jänecke, in Germany, was proceeding in an entirely different direction towards the elucidation of the clinker problem. Jänecke suggested that alite almost certainly contained the three constituents silica, alumina, and lime, and must therefore be considered to be a ternary compound. He thoroughly investigated the region of the ternary diagram corresponding to Portland cement, and believed he had discovered the existence of a new compound of the formula $8CaO.Al_2O_3.2SiO_2$, now known as Jäneckeite, the existence of which may be considered to be to some extent verified. None the less it can not be denied that many workers have doubted the existence of Jäneckeite. In this connection must be mentioned the German, Wetzel, who more than fifteen years ago carried out a vigorous campaign against Jäneckeite. Then, again, the existence of this compound is denied by the Americans, who believe it has been confused with tricalcium silicate, whose existence is in its turn doubted by Jänecke.

Dyckerhoff must preëminently be mentioned among the German research workers who have closely studied Jäneckeite. As a result of his investigations he at first recognized the existence of this compound, but with the limitation that it could play no part in the structure of clinker since it could only be synthesized from pure materials at temperatures much higher than that of cement burning. It has, however, already been pointed out that this point of view is not conclusive, since it is possible that Jäneckeite, if it exists at all, may crystallize from the sintered mass at temperatures much lower than that at which it is formed by the interaction of pure, solid ingredients.

Dyckerhoff's original acceptance of Jäneckeite has since been withdrawn under the influence of the American workers. During his visit to America he attempted, with Hansen, Ashton, and Bogue, to elucidate the structure of Jäneckeite by X-ray spectrography. The results were completely negative, and the four workers have therefore published a joint paper in which they state that the compound does not exist. Thereupon Jänecke attempted to obtain X-ray spectra of Jäneckeite. From one point of view, his attempts were equally unsuccessful, in that he concluded that the X-ray spectrum of Jäneckeite was identical with that of dicalcium silicate. Jänecke deduced from this a far-reaching isomorphism between Jäneckeite and dicalcium silicate, and attempted to confirm this conception by sketching the space lattices of the two compounds. In the present writer's opinion the proof is not convincing; so long as the existence of Jäneckeite remains open to question, the assumption of a close relationship with dicalcium silicate can not be admitted.

For the rest, Jänecke and his opponents contradict each other at every turn. While the opponents question the existence of Jäneckeite, Jänecke himself throws doubts on tricalcium silicate. In my opinion he goes much too far in this, for in spite of the almost impossible appearance of its formula from the stoichiometric standpoint, the existence of this compound must to-day be accepted without question.

For many years Jänecke supported the view that Jäneckeite may be identical with the alite of Portland-cement clinker. Even though the existence of this compound be admitted, however, its identity with alite must be decisively contradicted on the most comprehensive grounds. Jäneckeite contains one molecule of alumina to two of silica, *i.e.*, 102 parts by weight of alumina to 120 of silica! A compound in which the alumina content is almost as high as that of silica can never form the alite of clinker, since alite occurs in clinkers low in alumina as well as in those richer in alumina. If alite of the composition of Jäneckeite were present in a clinker low in alumina, it could only constitute a minute fraction of the whole mass. This, however, is far from being the case in reality, since it is actually in clinker poor in alumina that we observe the best and most copious alite formation. For example, in Fig. 2 the glass-clear alite crystals are clearly seen even in a clinker containing a negligible quantity of alumina.

Although Jänecke upheld his conception of the identity of Jäneckeite and alite over a period of fifteen years, he has recently, as a result of X-ray in-

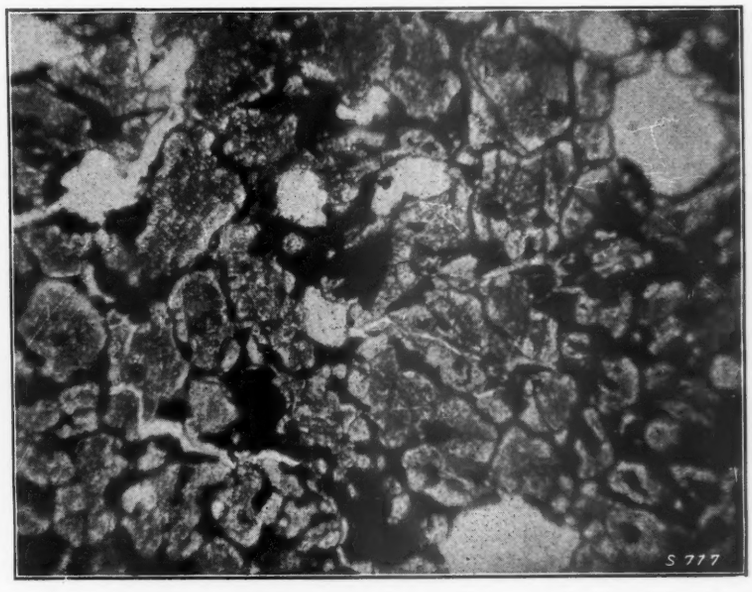


Fig. 2. Thin section of a high-lime clinker rich in iron oxide and practically free from alumina.

vestigations, allowed it to drop, and at present upholds the theory that alite may consist of an isomorphous mixture of Jäneckeite and dicalcium silicate. In this theory he has up to the present remained without adherents. Even before the methods of White and Emley were available I maintained that normal Portland-cement clinker contains no appreciable quantity of free lime. Jänecke's conception, even in its new form, can not be admitted. If it were correct, the alite of a clinker low in alumina must consist mainly of dicalcium silicate. If we then calculate the distribution of lime in such a clinker, we find that it must contain from 5 to 10 per cent. of free lime. Originally I opposed Jänecke's theory on purely theoretical grounds, based upon my own conviction that free lime is not present in normal clinker. Since then, however, experimental investigations, more especially those of Lorenz, carried out in my own laboratory, have proved that free lime is not formed in normal clinker, even though obtained from a high-lime raw mix, and it would therefore appear that Jänecke's theory must be conclusively rejected.

Nacken and Dyckerhoff have taken entirely different directions from Jänecke and the American workers in the hope of solving the alite problem. They have attacked the problem more from the practical side, and instead of studying the equilibrium in the liquid phase they have investigated the reactions between the solid constituents of the cement raw mix as the temperature is increased. The work of Dyckerhoff on the incomplete equilibria of the ternary system deserves particular attention, and ranks with the great work of the American investigators. Dyckerhoff has presented us with an excellent description of the course of the reactions resulting in the formation of the individual compounds of the ternary system. Unfortunately, however, he shares the fate of the American investigators in that the results of his work can not be directly applied to the problem of cement, principally because one of the most important components, viz., iron oxide, has not been considered. Admittedly, Dyckerhoff has also carried out a few isolated experiments with technical raw meals. These, however, did not go far enough, and when he professes to have established a far-reaching parallel between the burning of technical raw meals and his observations on mixtures of pure materials, to my mind his work fails to be convincing.

While Jänecke postulates a compound of high alumina content as the basic substance of alite, Dyckerhoff takes a diametrically opposite point of view, in that he considers dicalcium silicate to form the basic substance of alite. He does not, however, consider alite to consist of pure dicalcium silicate, but rather regards that compound as forming a vehicle for the solution of calcium oxide. He thus arrives at the conception that alite may consist of dicalcium silicate enriched by lime, the dissolved lime amounting to some 10 per cent.

The author regrets that he is also compelled to join the ranks of Dyckerhoff's opponents. Apart from the fact that a theory which totally neglects the importance of alumina in the structure of alite can not be satisfactory, Dyckerhoff's alite, in common with the later conception of Jänecke, suffers from the error of being too low in lime. Even if we

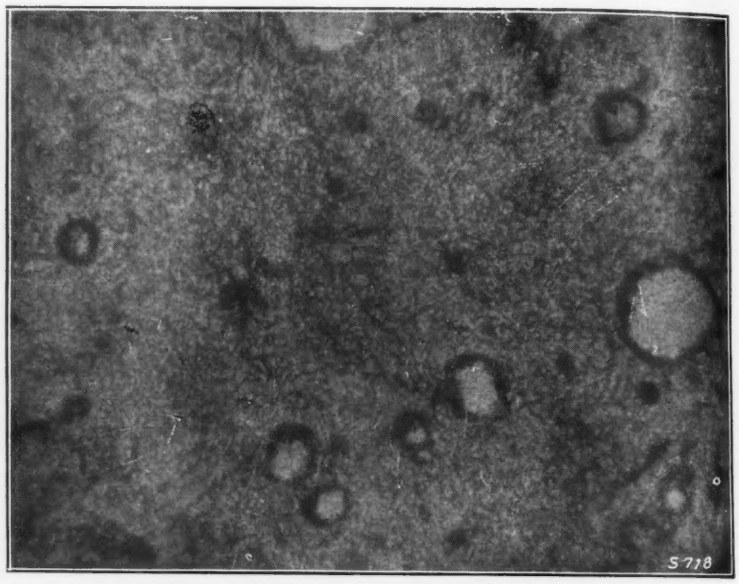


Fig. 3. Thin section of a clinker rich in alumina and practically free from iron oxide.

regard the lime dissolved in dicalcium silicate, in the sense upheld by Dyckerhoff, as combined or "not free," we are still unable to allocate among the various clinker constituents the remaining lime present in high-lime Portland-cement clinkers. In every case there remains an important excess of free lime. The death blow was given to Dyckerhoff's theory when it was proved that free lime is definitely not present even in a high-lime clinker, provided it be well-burned. Further it must not be overlooked that Dyckerhoff's theory is involved in the greatest difficulty by the fact that clinker which contains considerable amounts of dicalcium silicate "dusts" on cooling. This is true not only of clinker that is too low in lime, but also of clinker of normal lime content when burned at temperatures that are insufficient for the complete combination of lime.

The author ventures to reject the theories already advanced and offers a positive solution to the problem in representing alite as a range of mixed crystals of tricalcium silicate and Jäneckeite. This theory is based on the results of long experience of practical cement burning, and on the established results of microscopic investigations of clinker. Table II gives, *inter alia*, a summary of the optical properties of tricalcium silicate, Jäneckeite, and alite. It will be seen that the values for the refraction and double refraction of all three substances lie very closely together, and that in all three cases the minerals are optically negative. The only considerable

difference is in the angles between the optic axes. Even this fact, however, does not militate against the theory, since in the case of alite this angle is approximately midway between the values for the other two minerals, as would be expected from the law of mixed crystals.

TABLE II.—OPTICAL CONSTANTS

	Average Refractive Index	Double Refraction	Optical Character	Angle Between the Optic Axes
Tricalcium silicate	1.715	0.005	Negative	Small
Jäneckeite	1.705	0.004	Negative	Great
Alite	1.716	Very small	Negative	30°—40°
β dicalcium silicate	1.726	0.01	Positive	Great
Tricalcium aluminate	1.710	.....	Regular	....

The author's theory of alite is not based solely on these optical data. It is also in agreement with technical experience as interpreted by chemical considerations. It is only necessary to examine a large number of analyses of good cement to find that there is not a single case which can not be brought into agreement with this conception of alite (Table III). Admittedly, we can not regard the whole of the alumina of the clinker as contained in the alite. There is, however, no necessity for this, since in considering the minor clinker constituents part of the alumina is undoubtedly to be regarded as being present in the celite, to which we shall shortly refer.

TABLE III

	Tricalcium Silicate (*per cent.*)	Alite (limits) (*per cent.*)	Jäneckeite (*per cent.*)
SiO_2	26.39	26.39—17.96	17.96
Al_2O_3	.....	0—15.22	15.22
CaO	73.61	73.61—66.82	66.82

ALITE OF AVERAGE COMPOSITION

SiO_2	22.18 per cent.
Al_2O_3	7.61 per cent.
CaO	70.21 per cent.
Hydraulic modulus	2.36 per cent.
Silicate modulus	2.92 per cent.

It is hoped later to show that this theory of alite also satisfactorily agrees with the composition of high-strength cements, and even though we must later concede some slight variation of the present theory, it is believed that in its fundamentals that theory so correctly represents the composition of alite that it will undoubtedly survive the future without essential modification.

This theory, in representing alite as an isomorphous mixture of tricalcium silicate and Jäneckeite, assumes the existence of the latter compound. This is in some degree doubtful, but if Jäneckeite does not exist the only type of compound that can be considered as the companion of tricalcium silicate in alite is a simple aluminate, and choice is further restricted to pentacalcium trialuminate, or to tricalcium aluminate. Both these compounds crystallize in the regular system, and it is difficult to imagine that an isomorphous mixture of such optically different substances is possible. Nevertheless this solution of the alite problem must not be entirely disregarded. It was long ago put forward by Guttmann and Gille, and, in spite of the opposition of mineralogists, these investigators have adhered to their views until the present time. Indeed, according to their latest publications, equally strong reasons can be advanced for Guttmann and Gille's views as for my own theory. Only a short time ago, by the use of the centrifuge, these workers succeeded in isolating and analyzing almost pure alite. They showed that even in the case of high-alumina clinker the alumina content of alite is fairly low, and fairly accurately agrees with the formula of tricalcium aluminate. Should these experiments be confirmed it must be accepted that the tricalcium silicate of alite is accompanied, not by Jäneckeite, but by tricalcium aluminate. The practical difference between Guttmann and Gille's views and the author's theory is not great.

We shall now deal briefly with the remaining clinker minerals. These have received much less attention from investigators than alite, and the question of their composition is of negligible importance compared with that of alite. We will, therefore, shortly summarize present knowledge of belite and celite. All the other constituents of clinker are either known as pure compounds or are of such minor importance that they are only of scientific interest, and are unlikely to be of service in further elucidating the technical manufacture of cement.

Belite has been proved to have a lower lime content than alite and to consist mainly of a calcium silicate. These two definite facts should be sufficient to establish dicalcium silicate as the basic constituent of belite. In all probability belite consists of an isomorphous mixture of dicalcium silicate and other compounds, among which iron compounds must be present in view of the yellow color. To the fact that belite contains ferrites, and probably also aluminates, in solid solution, must be attributed its relatively great stability as compared with dicalcium silicate.

And, finally, what is the composition of celite? As has been already pointed out, we are here dealing with a composite mineral, which comprehends the dark-colored, iron-containing clinker mineral as a whole. While celite can, therefore, obviously vary in composition to some extent, the writer believes that a definite type generally predominates, and that this typical celite consists of a range of mixtures of the compound $4CaO.Al_2O_3.Fe_2O_3$ and dicalcium ferrite. A short time ago this compound $4CaO.Al_2O_3.Fe_2O_3$ was described, and its existence established, by Hansen, Braunmüller and Bogue, who also showed that it is capable of forming a series of mixtures with dicalcium ferrite. In this mixed crystal series, composed of lime, alumina, and iron oxide, the author envisages the typical celite of Portland-cement clinker, a view that is also held by other investigators, among whom may be mentioned Jänecke and Guttmann and Gille.

Let us now review the general structure of Portland-cement clinker as a whole, limiting attention to alite and celite, the principal constituents, and the only two that are invariably present in clinker. We obtain for the composition of such an "idealized" cement the following simple formula: As-

(*Continued on page 34*)

Mill and mixing-and-loading plant.

Opening the rock-asphalt quarry.

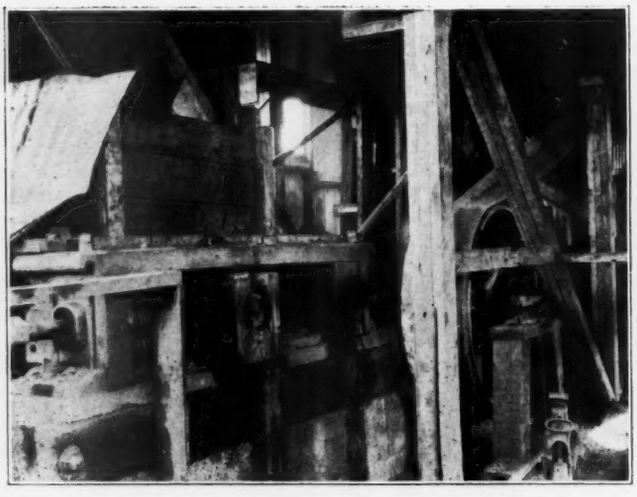
Rock-Asphalt Orders Force New Kansas Plant to Capacity Production

Natural Gas Supplies Power to Operate Plant; Bitumen Added to Final Product

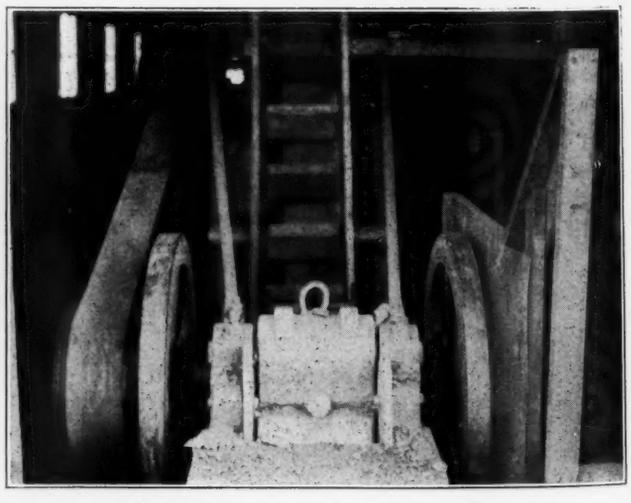
ONE of the most recent rock-asphalt plants in the district around Ft. Scott, Kan., is that of the Kansas Rock Asphalt Co., which went into operation in May of 1932. This plant is only one of a number that have been built in this vicinity during the past year. It is located within the city limits of Pleasanton, Kan., which is 24 mi. north of Ft. Scott, and has a capacity of 200 tons per day. The plant is owned by W. B. Stoker, formerly a paving contractor, and Dr. P. M. Kroll. The former's experience is invaluable in this connection for sales contacts and enables him to advise as to the use of the product.

The main deposit now supplying material to the plant is located a mile from the plant and consists of 160 acres of asphalt rock running about 25,000 tons to the acre. It is a sandstone with a bitumen content ranging from 6 to 12 per cent. with an average of about 7 per cent. As the state specifications require from 7 to 9 per cent. bitumen very little need be added. Before this property was leased it was thoroughly tested to a depth of from 12 to 15 ft. The estimated tonnage is based on this depth although good rock is present at greater depths in places. This material is being used by the state to resurface chat and gravel roads using the cold-mix method.

The overburden of dirt is very light. Drilling is done by hand but air-drills and a portable compressor will be used later. Under the layer of rock asphalt now being removed is a thin layer of flagstone under which there is more rock asphalt.



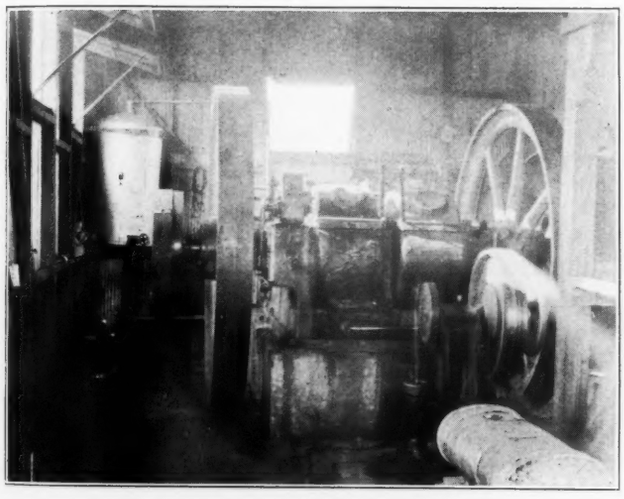
The primary and secondary roll-crushers.



Jaw-crusher, with bucket-elevator in background.

Loading into trucks is also done by hand to allow accurate selection of the rock.

The rock is hauled by truck to the plant, where it is piled alongside the plant. It is then fed by hand to the 16-in. United Iron Works primary jaw crusher which reduces it to 1½ in. and under. A belt-bucket-elevator feeds from the crusher to two 36-in. Webb City & Carterville roll-crushers for further reduction. A second elevator feeds a 4½-ft. by 20-ft. indirect-heat rotary drier which is fired with natural gas. The drier discharges to another belt-bucket-elevator which feeds a stationary screen provided with ¼-in. openings and set at an angle of 45 deg. The material retained on the screen is chuted back to the finishing rolls, while the fines go to a 5-ton steel bin, which feeds by gravity to a 1,000-lb. weigh-batcher that supplies a double-shaft pug-mill mixer. The bitumen is added here after being weighed by a separate suspended scale. The mixer discharges the finished material either into trucks below or to cars on a siding alongside the plant. Truck shipments are weighed on a Strait truck-scale. A siding from the Missouri Pacific Ry. provides for rail shipments.

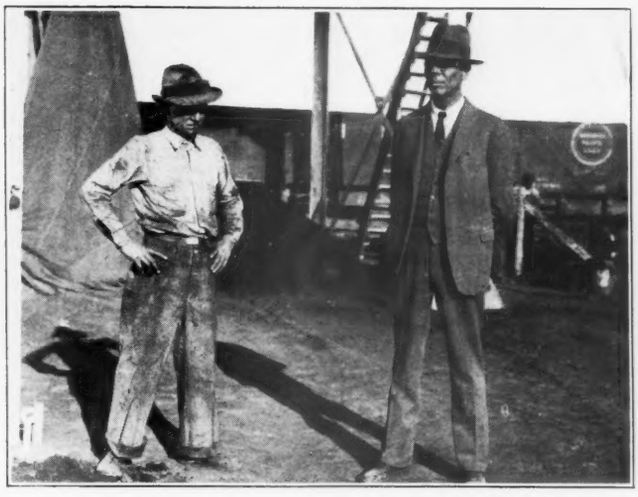


Natural-gas engine which operates the plant.

The bitumen added to the natural rock asphalt is obtained from a well which is owned by the company and is about 7 mi. from the plant. This well was drilled for natural gas but instead a pool of 18-gravity oil with a 65 per cent. asphalt content was encountered. Two additional wells are now being drilled. The oil is stored at the plant in five tanks having a total capacity of 600 bbl. A pump feeds from these tanks to a still, where the oil is heated to the required penetration before it goes to the mixer.

The entire plant is operated by a 90-hp. Bessemer Gas Engine Co. engine which uses natural gas as fuel. The various pieces of equipment are driven by belt and lineshaft or in some cases by Link-Belt chain. A small compressor is used to start the engine. The main plant structure is of timber with corrugated-metal siding and roofing but the mixing tower is of structural steel.

The plant has operated at capacity since it first went into operation and even now has orders in advance. All shipments to date have been made within the state, mostly for state highways, although some material has been used for Kansas City streets.



W. P. Stoker and Supt. Geo. McLaughlin.

The company also has a limestone rock-asphalt deposit located at Brooklyn, about 9 mi. north of the plant. This consists of 80 acres with a 4-ft. deposit covered by 4 ft. of dirt overburden. This material averages 6.63 per cent. bitumen. A plant may later be built at this location. As this material is more suitable for hot-mix its use will probably be confined to city-street paving.

Alpha *(From page 26)*

dows by day and by attractive lighting fixtures at night.

Miscellaneous.—The water used for the slurry and for other purposes comes from a creek about ¼-mi. from the plant. A small pump-house contains two Goulds 8-in. by 10-in. triplex pumps, each driven by a 20-hp. motor. A 50,000-gal. water-tank alongside the kiln-feed building insures a reserve supply in case of a dry season and provides for fire protection. A connection to the city water-mains furnishes drinking water and can be used for other purposes in case of failure of the regular water-supply.

Electricity, received from the power company at 13,000 v., is reduced to 2,300 v. at an outdoor sub-station. This voltage is used for the larger motors and for the electric shovel. It is further reduced to 440 v. for the smaller motors by transfomers in one end of the mill building. The 20-panel main switchboard located there controls all plant departments. On one side of this electrical equipment are the two compressors which furnish air for the plant and quarry, both of Ingersoll-Rand make. One is 18-in. by 11-in. by 14-in. and is driven by a 175-hp. motor. The other is 15-in. by 9½-in. by 12-in. and is driven by a 125-hp. motor. Two 435-hp. motor-generator sets, only one of which is used at a time, furnish direct current for the motors

in the kiln department. One of these is arranged so that it may be driven through a clutch by a 240-hp. Sterling gasoline engine in case of power failure. The fact that all this equipment has given no trouble is a tribute to the efficiency of the dust-collecting system in the mill building.

A Brown Hoisting Machinery Co. 15-ton steam locomotive-crane, handling a 1½-cu. yd. Blaw-Knox clam-shell bucket, is used for general utility about the plant and grounds. Several small Goulds electric-motor-driven centrifugal pumps mounted on wheels can be moved to any part of the plant as needed.

The main office of the Alpha Portland Cement Co. is at 15 S. Third St., Easton, Pa. The company's officers are: G. S. Brown, president; F. G. McKelvy, vice-president; F. M. Coogan, vice-president; R. S. Gerstell, secretary; and J. J. Matthes, treasurer. H. O. Underhill is southern manager as well as superintendent of the Birmingham plant and has offices in the Webb Crawford Bldg., Birmingham, as well as at the plant. The plant personnel consists of B. H. Adams, chief chemist, and G. D. Youell, general foreman.

Mica Production Lowest in Decade; Sales Made by 11 States

In 1931 general conditions in the mica industry in the United States were unfavorable, and compilations of individual reports of producers reveal that the quantity and value of unmanufactured sheet mica marketed in 1931 (including punch, larger than punch, and splittings), were lower than for any year since 1921. Of the 10-yr. period 1922-1931, inclusive, figures for scrap mica, although showing decreases in both quantity and value in 1931, as compared with 1930, were higher in 1931 than corresponding figures recorded for 1924, 1927, and 1929.

Prices of all grades of sheet mica were lower than those of 1930, and for the first quarter of 1932 show further recessions. Prices of scrap mica in 1931 were not as firm as in 1930, and although the range in value per ton was about the same, the average value per ton was about $1 less than in 1930.

As the new tariff on mica was in effect for only six months of 1930, total imports of mica in 1931 are not strictly comparable with those of 1930. However, in 1931 total imports of unmanufactured mica (general imports) were 4,569,799 lb., valued at $129,827, as compared with 4,555,295 lb., valued at $453,052 in 1930.

The total quantity of uncut mica (including sheet and scrap mica) sold or used by producers in the United States in 1931, was 7,102 short tons, valued at $211,245. As compared with 1930, these figures show decreases in quantity and value of 4.9 per cent. and 26.2 per cent., respectively. Of the total quantity sold 481 short tons (962,953 lb.), valued at $111,830, was sheet mica, including 757,647 lb. of punch mica, valued at $33,317, and 205,306 lb. of mica larger than punch, valued at $78,513. A small quantity of uncut domestic splittings is included in the sales of sheet mica. In addition to sales of sheet mica, there were 6,621 tons of scrap mica sold in 1931, valued at $99,415.

Dr. Kühl (*From page 31*)

suming that alite consists of tricalcium silicate and Jäneckeite, according to the author's theory, it may be represented by the following formula:

$$\text{Alite} = x\,3CaO.SiO_2 + y\,8CaO.2SiO_2.Al_2O_3,$$

and since Jäneckeite can formally be considered as a double compound of tricalcium silicate and (hypothetical) dicalcium aluminate [$8CaO.2SiO_2.Al_2O_3 = 2(3CaO.SiO_2) + 2CaO.Al_2O_3$], alite can also be expressed in terms of these two compounds.

$$\text{Alite} = x_1\,3CaO.SiO_2 + y_1\,2CaO.Al_2O_3\,(x \geq 2y_1).$$

In the same way celite can be represented as follows:

$$\text{Celite} = x\,4CaO.Al_2O_3.Fe_2O_3 + y\,2CaO.Fe_2O_3.$$

Here again, the first constituent can be formally represented as a double compound, $4CaO.Al_2O_3.Fe_2O_3 = 2CaO.Al_2O_3 + 2CaO.Fe_2O_3$.

By substitution, we thus obtain the following formula for celite:

$$\text{Celite} = x_1\,2CaO.Al_2O_3 + y_1\,2CaO.Fe_2O_3\,(x_1 \leqq y_1).$$

Or, in words, we have

Alite=Tricalcium silicate+Dicalcium aluminate.

Celite=Dicalcium ferrite+Dicalcium aluminate.

We thus see that the three substances tricalcium silicate, (hypothetical) dicalcium aluminate, and dicalcium ferrite may be considered mathematically as the ingredients of an idealized Portland cement, in which they appear in varying combination as alite and celite. It will be remembered that these three substances have been put forward as the "final products of the combination of lime" in the genesis of clinker, and the associations which led to this statement will now be perceived.

Sec. Hyde Opposes Use of Foreign Cement in Road Building

The following statement was issued August 31 by Secretary of Agriculture Arthur M. Hyde:

"Protests have come to my attention regarding the use by road contractors of cement and other material manufactured in other countries on roads supported by federal funds.

"Road construction is under the jurisdiction of the states and territories.

"The federal government lacks authority to point out that the intent of Congress in passing emergency appropriations for the construction of public roads was to afford employment. That intent was not limited to those engaged directly in road building, but included as well those who would be engaged in the production of material. In my opinion, there is a strong, moral implication, arising from the emergency character of such appropriations, that preference in the materials used should be given to materials produced in this country."

Czechoslovakian Plant Produces Alumina Cement by Electrical Fusion

By Dr. Ing. M. KAUCHTSCHISCHWILI

NEITHER fused alumina cement nor the electric furnace are at the present time of the commercial importance in America that they are in Europe; nevertheless, this article, describing this manufacturing process in an interesting new plant, will undoubtedly be of interest to American producers because of its novelty and efficiency.—Editor.

THIS is a description of an electric-furnace installation for the production of fused alumina cement which was designed, equipped and erected by the Siemens & Halske Akt.-Ges. for the Königshofer Zementfabrik at Tschischkowitz, Czechoslovakia. All the electrical and furnace equipment was supplied by Siemens & Halske, but the mechanical part of the plant—the machinery for preparing the raw materials and for handling the cement clinker after it has been fused—was erected in Tschischkowitz after plans of the management of the Königshofer company.

The general lay-out of the plant is shown in Fig. 1. The raw materials—bauxite and calcined lime—are crushed and are then carried by belt-conveyor and elevator to their respective bins. The crushed bauxite passes from the bin to the rotary calciner, in which it is heated to about 800 deg. C. In this way the water contained in the bauxite is driven off, so that only the task of fusing is left to the electric furnace. From this drier the bauxite passes to a second bin alongside the lime bin. The discharge openings from both bins lie above the weighing and measuring apparatus, by means of which the required raw mix can be obtained. The mix is then fed into a conveyor skip and is hoisted up an incline to a feed-bin, and thence is fed through a revolving spout into the furnace. Naturally, the equipment is so arranged that the hot bauxite is received in a well-insulated bin, and the raw mix thus reaches the furnace warm.

Fig. 2 shows a cross-section of the furnace, which is specially designed for the production of fused material. It is equipped for three-phase alternating current, and is provided with three round carbon electrodes arranged in a triangle. The bottom of the furnace is protected by means of a special lining and the side walls by water cooling. In the construction of this fusing furnace consideration was given throughout to the peculiar properties of the fluid fused cement. As the melting point of the 4-component mixture—alumina, lime, iron oxide and silica—lies comparatively low (about 1,400 deg. C.), any overheating of the fluid mass must, to avoid inconvenient secondary reactions and vaporization losses, be absolutely prevented. This is accomplished by the generous cross-section of the electrodes and the correspondingly low current density at comparatively high arc voltage, by the large surface of the fluid mass and by "covered fusing," which can be well achieved with a double-shelled furnace (for which German patent has been applied). Losses from radiation and conductance of heat are also greatly reduced in this new type of furnace, so that it has been possible to establish the unusually favorable current consumption of 800 kw.-hr. per metric ton of cement clinker and an electrode consumption of only 8 kg. per ton.

In this particular case the furnace was built movable, but it can also be built permanent. It is provided with two tap holes, one of which serves for drawing off the fused cement, while the other can be used for drawing off iron which may be reduced in the furnace. The winning of iron as a by-product comes into consideration if bauxite of high iron content is to be used, or if the production of cement low in iron is required.

The arrangement and construction of the carbon electrodes used by the Siemens & Halske Akt.-Ges. is apparent from Figs. 2 to 5. The electrodes, with a diameter of 500 mm., are made of carbons which are 2 to 3 m. long, are joined by conical nipples, and are held by friction grips which are cooled by water. This type of friction grip, with its contracting mechanism, consists of water-cooled jaws which are of cast special alloy and are held together by a cast-steel ring, which likewise is water-cooled. Thrust screws led through the cast-steel ring are provided for contracting the jaws. The grip is suspended by the jaws, which are fastened by links to a supporting cylinder above. The whole apparatus is hung by four chains which lead to the hoisting winch.

The suspension mechanisms for all three electrodes are supported at the upper operating level, where fresh carbons are joined to the electrodes, by a roof-girder structure on which all necessary guide sheaves are arranged. This structure, with the ends of the three electrodes, can be seen in the background of Fig. 3, while in the foreground can be seen the hoisting winches with their motor drives. The adjustment of the electrodes is accomplished by electric motors, either by hand control or by switching in a special automatic electrical electrode control. This electrical control makes it possible to advance the electrodes in accordance with any desired furnace capacity.

Water-cooled copper pipes, which at the same time serve as conduits for the cooling water for the electrode grips, are used for carrying the current in the vicinity of the hot furnace. To these water-cooled pipes are attached flexible copper bands,

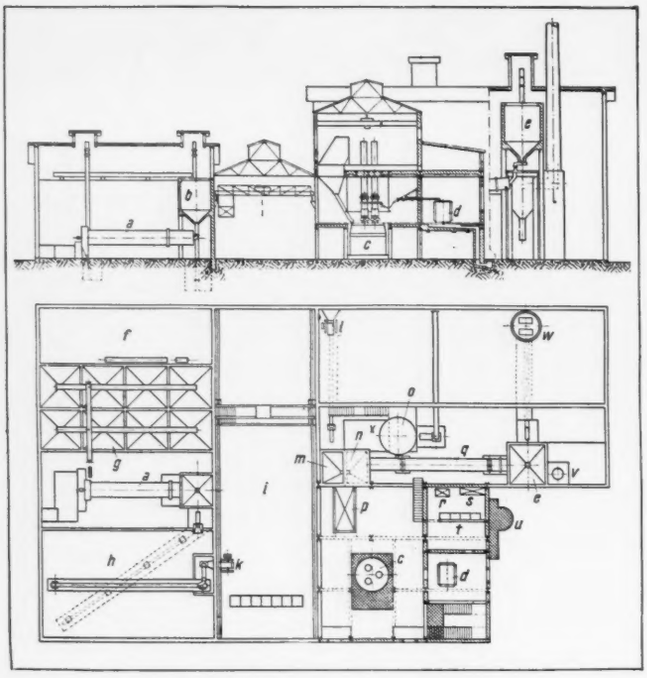


Fig. 1. General arrangement of Tschischkowitz cement plant. *a*, finish-grinding mill; *b*, clinker bin; *c*, electric furnace; *d*, transformer; *e* and *n*, bauxite bins; *f*, bagging plant; *g*, cement silo; *h*, clinker storage; *i*, cooling chamber; *k*, clinker crusher; *l*, lime crusher; *m*, lime bin; *o*, coal bin; *p*, opening for hoisting incline; *q*, rotary drier; *r*, transformer; *s*, motor-control; *t*, switchboard; *u*, oil-pit; *v*, stack; *w*, bauxite dry-pan; *x*, burner.

which in turn are connected with rigid copper bars coming from the transformer. This arrangement is shown in Fig. 5. The transformer terminals are united with the bars by means of a flexible connecting piece, so that in case of expansion of the copper bars damages to the transformer are avoided (Fig. 6). The set of rigid copper bars (in triangular form) and the flexible copper bands as well are so arranged that because of the mutual action of the fields self-induction is kept at a low point.

The arrangement described here has yielded a *cos* Φ of 0.92.

An outlet hood, connected with a powerful fan, is provided to draw off the dust and the gases that are generated. The gas outlet hood is so efficient that the furnace space is completely cleared of the unpleasant gases and the dust (particularly lime dust).

This installation, as has been mentioned previously, operates with continuous cooked electrodes, such as are supplied by the Siemens-Planiawerke für Kohlefabrikate, in friction grips. The advantages of this grip and of this kind of electrodes, as compared with the unit electrodes held at the top, which were previously used, consist particularly in that the furnace can be operated without interruption, as no replacement of electrodes is necessary. The connection of fresh carbons to the electrodes requires no halt in the operation. A further advantage of these electrodes lies in the elimination of the electrode remnants, and in the economical consumption of electrode carbon, as well as the low heat and power losses. Power losses are reduced by the fact that in the continuous electrode the friction grip is attached very low, so that the portion of the electrode that actually carries current can be less than in the case of the top-grip. It should also be observed that with the use of continuous electrodes a loss in production is avoided because of the advantages that have been mentioned, so that the efficiency of the installation is raised.

Fig. 7 shows the lower part of the furnace with the outlet for the fluid cement, as well as the electrically-operated ingot car, on which are placed some 20 cast-iron heavy-walled molds into which the fluid cement is drawn. The capacity of each mold is approximately 275 to 325 kg. The ingot car, after completion of the draw, is pushed into the cooling chamber, where the ingot molds, after their contents have hardened, are lifted one by one by a crane and dumped. The solid blocks of the hardened cement are carried to storage, and are reclaimed as needed for crushing; from this point

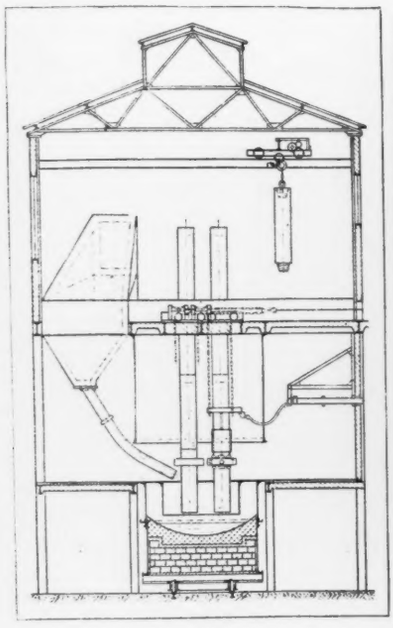


Fig. 2. Sectional view of electric furnace.

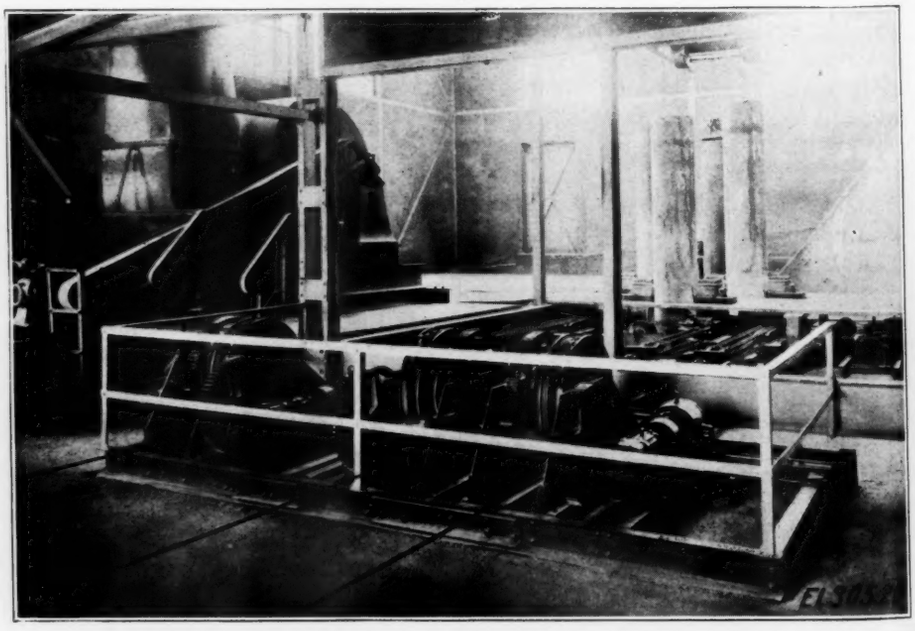


Fig. 3. Upper operating level, with motors for handling electrodes; three electrode ends seen in background.

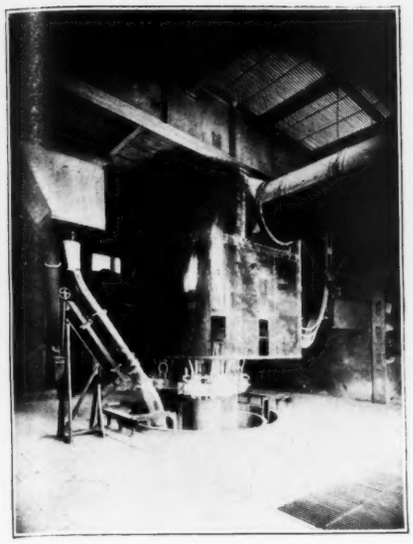


Fig. 4. Suspension apparatus for the electrodes.

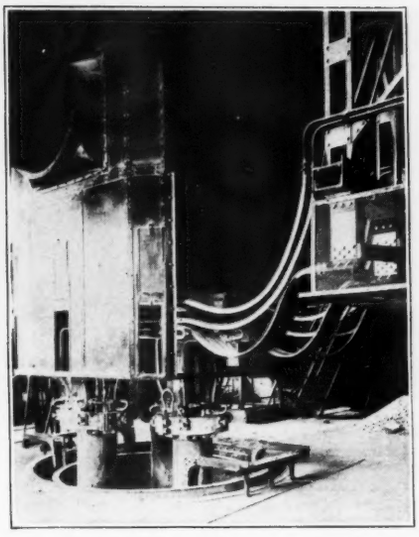


Fig. 5. Flexible conduits from power bars to the electrodes.

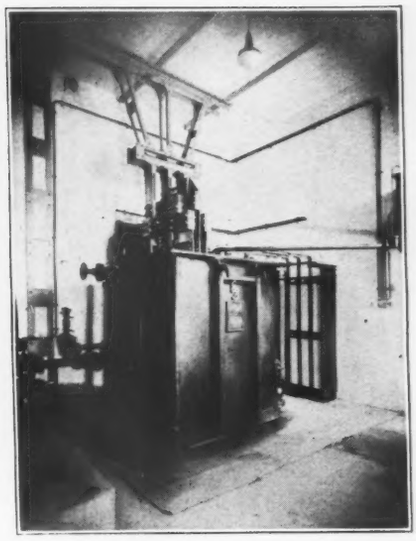


Fig. 6. Transformer with flexible connection between terminals and power bars.

the material is handled in the same way as ordinary cement clinker.

A particularly strong mill construction is required for the grinding of the fused cement, because the alumina-cement clinkers show a greater hardness than those of Portland cement. It is also desirable to grind the alumina fused cement clinker to a greater fineness (2 to 3 per cent. remainder on the 4,900-mesh sieve—about 175 meshes per lineal inch). The furnace operates normally without interruption, but it can also operate intermittently, according to the power conditions existing at the plant. Every 2 to 3 hr. some 4 to 6 tons of cement is drawn off. With a load of some 2,000 kw.—the transformer is provided for 2,500 kv.-a. capacity—the daily production of cement is about 60 tons.

The installation described is distinguished by a thorough mechanization of the preparation and handling of the raw materials as well as of the conveying and further processing of the cement clinker produced. Only two men per shift, aside from the superintendent who oversees the whole plant, are required for the attendance of the furnace operation.

The money-making capacity of the plant is determined essentially by the costs of the raw materials—bauxite and calcined lime—as well as the electric power. In regions where either electric current or the raw materials can be obtained very cheaply the production costs for fused alumina cement can be so greatly reduced that they approach those for super-Portland cements. Under certain conditions the production costs can be even more favorable, particularly in countries where rich bauxite deposits and abundant water-power are available, but where coal can be obtained only at high prices.

The following data will be of service in calculating the costs of production:

One metric ton of fused alumina cement requires the following:

0.7 to 0.8 tons of bauxite (according to composition).

0.4 to 0.45 tons of burned lime (according to composition).

700 to 800 kw.-hr. of power (according to quality of the raw materials).

7 to 8 kg. of electrode carbon.

On the basis of these data the material and power costs can be calculated for local conditions by inserting the prevailing prices for the materials and power. To these are added the costs for labor, repairs, power costs for grinding and auxiliary operations, packing, amortization and interest.

The installation described here provides an example for a new field of utilizing electrical power and for the large bauxite deposits which in many countries are still poorly utilized. With the construction of further installations, particularly those with larger furnace units, it should be possible to attain still better results in the fusing and correspondingly higher economy in the electrical fusing process for the production of alumina cement on a large scale.

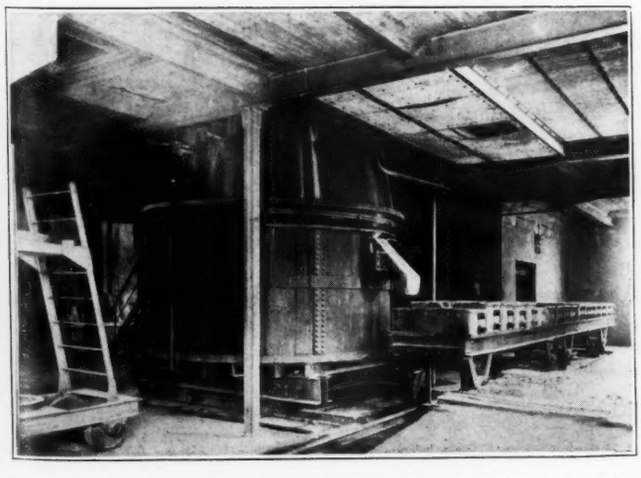


Fig. 7. Lower part of the furnace, with outlet for the fluid cement, and ingot car.

Japanese Cement Exports Show Huge Increase in Recent Years

THE demand for cement in the Eastern Hemisphere, omitting Europe, has increased 330 per cent. in 17 years. In 1913, according to recent estimates, all the countries of Asia, Africa (South and East), and Oceania consumed about 11,000,000 bbl. of cement, 75 per cent. of this amount being produced within the various countries and the remainder imported, largely from Europe. In 1929 this consumption had reached 48,000,000 bbl., of which 86 per cent. was met by domestic production and the rest by import. These figures indicate not only a great growth in demand, but also a strong tendency toward self-sufficiency within the different countries. An additional development is the appearance of Japan in first place among sources of imported cement for this area, furnishing more than one-third of the total ocean-borne receipts.

Between 1925 and 1930 Japan increased its cement exports to British India more than eight times, more than quadrupled those to China, quadrupled exports to the Straits Settlements, tripled those to Netherland India, and doubled those to the Philippine Islands. In 1930 Japanese cement appeared for the first time in New Zealand and East Africa, as well as in some markets in the western Hemisphere—Peru, Argentina, and Central America. In 1931 Japanese exports of cement totaled 2,613,000 bbl., compared with 2,862,700 bbl. in the preceding year. Distribution of the 1931 shipments is not yet available, but smaller contributions to Chinese markets accounted for part of the decline.

The accompanying table shows destinations of exports for the latest years available compared with those in 1925.

Country of Destination	1925	1928	1929	1930
China:	*bbl.*	*bbl.*	*bbl.*	*bbl.*
China proper	53,538	75,665	148,486	236,922
Kwantung Province	98,834	59,837	82,502	52,757
Hong Kong	64,270	222,827	414,754	574,254
British India	28,058	91,162	107,608	218,952
Straits Settlements	121,048	323,421	226,367	432,460
Netherland India	314,328	601,153	854,525	925,202
French Indo-China	36,921	54,742	32,970	52,051
Asiatic Russia	2,771	4,394	5,608	10,524
Philippine Islands	106,248	269,940	348,395	264,183
Siam	72	24,660	26,719	34,167
Great Britain	1	.....	2	2,394
Mexico	.....	.....	.....	2,899
Peru	350	.....	1	2,509
Argentina	.....	.....	756	1,398
South Africa	.....	.....	15	1,611
East Africa	.....	4,483	11,467	22,111
New Zealand	.....	.....	.....	25,526
All other	13,837	3,222	1,695	2,823
Total	840,276	1,735,506	2,261,870	2,862,743

It has been claimed that the markets which Japan first entered in 1930 can not be held long because entrance was made in a period of economic stress, when to sell at any price obtainable was a practice rather than an exception. Small exports to scattered areas, however, may reasonably be expected to be repeated for an indefinite period, since slight local demand will not permit erection of local production units. In some places, like British India, moreover, the maintenance of domestic freight rates in the face of falling commodity prices has allowed an increased entry of foreign cements at coastal points on account of the inland location of the domestic cement plants. In the Far East the port cities, the largest areas of population, are naturally the chief cement-consuming centers also.

In all recent years Netherland India has been the principal foreign customer for Japanese cement. In the two or three years ending with 1931 this country experienced a mild building boom, and in 1930 developed a domestic production of 1,500,000 bbl. of cement in addition to importing almost a million barrels from Japan.

In the case of China, Japan's second best customer, returns have been supplied for three separate districts—China Proper, Kwantung Province, and Hong Kong. Of the three, Kwantung is outstanding, and the total for all reached about 850,000 bbl. in 1930. China had a domestic cement production estimated at 6,000,000 bbl. in 1931, but difficulties with transportation and other conditions have precluded development of a self-contained market within the country, so that imports last year rose to over 1,000,000 bbl., although purchases from Japan declined.

Manchuria had been expected to offer an increasing market for Japanese products, particularly cement, but the demand in that area has so far not been up to expectations. Japanese export trade also has been limited by the Chinese boycott and by the preferential duties inaugurated by some British colonies to favor imperial sources of imports.

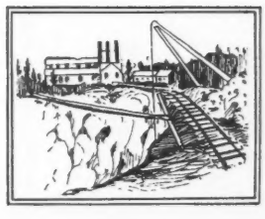
In 1913 Japan produced about 3,750,000 bbl. of cement, which fairly represents consumption for that year, as imports and exports were about balanced. By 1929, a year indicative of normal expansion, this output had risen to 23,000,000 bbl., of which over 2,250,000 bbl. were exported. The Japanese industry is regarded as nationalized, being in the control of three leading companies, the Mitsui, Mitsubishi, and Asano. Through an effective sales corporation and production agreement there have been eliminated many of the overhead and other losses which contributed to a high consumer cost for cement.

Notwithstanding these economies, the great reduction in construction work both within Japan and abroad has forced curtailment of production to a level about 25 per cent. of actual capacity. In 1931 curtailment was about 50 per cent. of capacity, which was reported at about 38,000,000 bbl., while output for the year was 19,000,000. Despite the greater reductions in the current year recent reports show the usual dividends by the larger subsidiary companies making up the cement sales organization, and a reasonable assumption places Japan in a commanding position in the growing export market for cement.

MEN OF THE INDUSTRY

OLIVER A. DIBBLE

MR. DIBBLE has been connected with the cement industry for more than 24 years in various capacities, most of the time with the Aetna Portland Cement Co. For 14 years he was chief chemist at the Fenton, Mich., plant and later at Bay City, Mich., when that plant was built and went into operation in 1923. Mr. Dibble was appointed general superintendent in May, 1930. Since that time an extensive program of expansion and improvement has been successfully carried forward at both plants.



Personal Mention

M. J. Epley, New Orleans, La., **Wm. E. Ellis**, New York, N. Y., and **W. J. Winston**, Chicago, Ill., are interested in the establishment of a fuller's-earth plant to be located near Mobile, Ala., and for which a contract has been let to the Allis-Chalmers Manufacturing Co., of Milwaukee, Wis.

E. M. Underwood, for the past fourteen years connected with Fairbanks, Morse & Co. as sales engineer, has joined the combustion engineering department of The Patterson Foundry & Machine Co. and will make his headquarters at East Liverpool, O.

E. H. Richardson, district engineer at Salt Lake City for the Portland Cement Assn., addressed the Engineering Council of Utah at its August luncheon held recently. Mr. Richardson's topic was "The Proposed Unemployment Relief Projects for Utah."

N. D. Moore, president, Pacific Coast Cement Co., Seattle, Wash., accompanied by Mrs. Moore and their daughter, Evelyn, returned home by steamer from Los Angeles recently after having attended the Olympic games.

H. Birchard Taylor of Philadelphia has been elected president of the Diesel Engine Manufacturers' Assn., succeeding **George W. Codrington** of the Winton Engine Co. of Cleveland, who was elected chairman of the board. **E. T. Fishwick** of the Worthington Pump & Machinery Corp. continues as chairman of the executive committee. Mr. Taylor proposes to devote a considerable proportion of his time to the active management of the association. The Diesel Engine Manufacturers' Assn. was organized in 1928 and has since been active in promoting trade standards in the Diesel industry and in gathering Diesel engine statistics.

Julius F. Stone has been elected president of the Case Crane & Kilbourne Jacobs Co., Columbus, O., makers of the K. & J. line of quarry cars, drag scrapers, traveling cranes, etc. Mr. Stone is well known in industrial circles, being president also of the Columbus-McKinnon Chain Corp. and Chisholm-Moore Hoist Corp., both of Tonawanda, N. Y. He will be assisted in his new position by **H. C. Hoeflich**, who has just been chosen vice-president and sales manager.

Julius F. Stone.

O. C. Hart, superintendent of the Utah-Idaho Cement Co. of Ogden, Utah, now in receivership, has gone to Monolith, Cal., where he is doing some special work for the Monolith Portland Cement Co.

J. R. Withrow, professor of chemical engineering at Ohio State University, Columbus, O., is the newly-elected chairman of Committee C-7 on Lime of the American Society for Testing Materials.

W. A. Eplin of Wallace, Ida., has made application to the Montana Land Department for a phosphate-rock mining lease on land near Drummond, Mont.

Obituary

S. A. Perkins, 69, one of the founders of the Waukesha Motor Co., industrial engine manufacturers, died at a Stevens Point, Wis., hospital recently. Mr. Perkins had been ill several months. Besides being secretary and treasurer of the motor company, he was director and officer of nearly a dozen Waukesha, Wis., enterprises and one of the city's most prominent civic leaders.

Dr. William Leon Ellerbeck, president of the Nephi Plaster & Manufacturing Co., the Utah Lime & Stone Co. and the Utah Stucco Products Co., prominent Utah concerns, passed away following an operation, August 12 at Salt Lake City. Dr. Ellerbeck was a member of the American Ceramic Society, American Society for Testing Materials, National Lime Assn., and the National Dental Assn., he having began life as a dentist. He was born in Salt Lake City Sept. 4, 1874, and was graduated from the University of Utah after specializing in chemistry and metallurgy.

Harry Evans of Chicago, an engineer on the sand dredge, *Nassau*, was fatally injured in a freak accident while the vessel was discharging its cargo in the Calumet River at South Chicago, Ill., recently. Mr. Evans was lowering the ship's anchor by means of a hand wrench when the handle spun around and struck him on the head.

Coming Events

September 8, 1932. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

September 20-22, 1932. Chicago, Ill. Annual meeting, Roadmasters and Maintenance of Way Assn.

September 29-October 1, 1932. Pittsburgh, Pa. Annual conference, International Assn. of Public Works Officials.

October 3-7, 1932. Washington, D. C. Twenty-first Annual Safety Congress, National Safety Council. W. H. Cameron, secretary, 20 N. Wacker Drive, Chicago, Ill.

October 5-8, 1932. Atlantic City, N. J. Fall meeting, American Society of Civil Engineers.

November 14-18, 1932. Washington, D. C. Annual meeting, American Assn. of State Highway Officials.

December 5-9, 1932. New Orleans, La. Tenth Annual Asphalt Paving Conference and annual meeting, Assn. of Asphalt Paving Technologists. Under auspices of Asphalt Institute, 801 Second Ave., N. Y.

December 5-10, 1932. New York, N. Y. Tenth National Exposition of Power and Mechanical Engineering. Under management of International Exposition Co., Grand Central Palace. New York, N. Y.

Jan. 16-20, 1932. Detroit, Mich. Highway and Building Congress. Annual Conventions and Combined Show of National Crushed Stone Assn., National Sand & Gravel Assn. and National Ready-Mixed Concrete Assn., Book-Cadillac Hotel.

Traffic News and Comment

Recent I. C. C. Decisions

Agricultural Lime.—Reparation has been awarded on finding that the rates on agricultural lime from Berkeley, W. Va., to destinations in Virginia were unreasonable to the extent that they exceeded those prescribed in North American Cement Corp. *v.* A. & R., 153 I. C. C. 431 and 163 I. C. C. 701.—I. C. C. Docket No. 24,456, Bone Dry Fertilizer Co., Inc. *v.* A. C. L. *et al.* (PIT AND QUARRY, Feb. 24, 1932.)

Crushed Stone.—Reparation has been awarded on finding the rates on crushed stone from Atlas, Highland and Limestone, Ky., to destinations in West Virginia unreasonable to the extent that they exceeded or may exceed the rates shown in a mileage scale, with the addition of 20 c. to destinations on the Ripley and Spencer branches. An allegation of undue preference for certain Ohio origins was not sustained. Rates at various intervals on the prescribed scale are, 50 mi., $1.00; 100 mi., $1.20; 150 mi., $1.40; 200 mi., $1.60.—I. C. C. Docket No. 24,394, Olive Hill Limestone Co. *v.* B. & O. *et al.* (PIT AND QUARRY, April 6, 1932.)

The order in the original report, 183 I. C. C. 742 (PIT AND QUARRY, June 29, 1932), prescribing rates on crushed stone and related articles in the South, has been modified to permit grouping of origins and destinations, the groups to be those permitted in the southern class-rate revision.—I. C. C. Docket No. 22,315, Liberty Lime & Stone Co., Inc. *v.* A. & R. *et al.*

Dry Building Mortar.—The carriers have been authorized to publish rates on dry building mortar from Osborn, O., to southern points, without observing the long- and short-haul clause of Sec. 4. This order is subject to the same general conditions as outstanding fourth section orders relating to corresponding rates on cement.—I. C. C. F. S. O. No. 10,992.

Sand and Gravel.—The commission has corrected the original report in 179 I. C. C. 389 (PIT AND QUARRY, July 13, 1932), in which it found the rates on asphalt aggregate from Big Clifty, Ky., to certain West Virginia destinations unreasonable.—I. C. C. Docket No. 24,009, O. A. Smith Agency, Inc. *v.* I. C. *et al.*

Examiners' Reports

Cement.—Examiner W. A. Disque recommends that the commission find the rates on Portland cement, from Portland, Colo., to destinations in Kansas, Oklahoma and New Mexico, unreasonable and unduly prejudicial to the extent that they exceed or may exceed the rates made by the use of Scale IV, with the addition of differentials to destinations west of Alayton, N. M., as applied on cement from other points in Colorado, Kansas, Oklahoma and Texas.—I. C. C. Docket No. 24,928, Colorado Portland Cement Co. *v.* A. T. & S. F.

Examiner W. A. Disque proposes that the commission find the rates on cement from Ada, Okla., to destinations in Arkansas and Louisiana, not unreasonable, and dismiss the complaint.—I. C. C. Docket No. 24,805, Oklahoma Portland Cement Co. *v.* K. C. S. *et al.*

Examiner Myron Witters recommends that the commission find the rates on cement, from Louisville, Neb., to destinations in western Minnesota, North and South Dakota in extended Scale III territory and to points in North Dakota in extended Scale IV territory, not unreasonable but unduly prejudicial to Louisville and unduly preferential of Mason City, Ia., Duluth and Steelton, Minn., Hanover and Trident, Mont., and Rapid City, S. D. He proposes that the undue preference and prejudice may be removed by the establishment of rates from Louisville by using the present revised Scale III to extended Scale III territory in Minnesota, North and South Dakota, and the present revised Scale IV to extended Scale IV territory in North Dakota. Distances from Louisville should be computed according to the formula prescribed in Oklahoma Portland Cement Co. *v.* D. & R. G. W., 128 I. C. C. 63; and temporary fourth-section relief should be granted.—I. C. C. Docket No. 25,026, Ash Grove Lime & Portland Cement Co. of Neb. *v.* C. B. & Q. *et al.*

Crushed Stone, Sand, Gravel and Slag.—Examiner Claude A. Rice proposes that the commission take jurisdiction in the matter of rates on coarse aggregates within the state of Ohio, finding that the present intrastate rates are unjustly discriminatory against interstate commerce and unduly preferential of shippers in Ohio and unduly prejudicial to shippers in western Pennsylvania and West Virginia. The Ohio state rates were brought to the attention of the commission with the filing of five thirteenth-section complaints by the shippers in western Pennsylvania and West Virginia. These complaints were followed by a thirteenth-section petition filed by the Ohio carriers except the Nickel Plate, the Wheeling and the A. C. & Y. The rates from Pennsylvania and West Virginia were made on the basis of the West Pennsylvania scale shown below, some roads adding the joint-line arbitrary of 20 c. and some waiving it. The carriers in their petition asked for prescription of this scale in Ohio. The Nickel Plate opposed the scale with the joint-line arbitrary and asked for a grouping of origins. Shippers in Ohio were divided in their recommendations, all however being agreed that the scale sought was too high to allow the traffic to move freely. Sand, gravel and slag shippers generally favored the establishment of a mileage-scale basis and were joined by one crushed-stone shipper located in the central part of the state. Crushed stone shippers in the northwest part of the state were united in opposition to a mileage scale. Evidence was introduced by Ohio shippers intended to prove that there was no violation of Sec. 13, but no attempt was made to oppose the allegation of the complainants that the present rates resulted in undue prejudice to them. A map exhibit, introduced by W. D. Goble, traffic manager, National Lime & Stone Co., Findlay, O., showed the location of plants producing coarse aggregates in Ohio, these locations being so placed that practically any point in the state could be served by motor truck. Carriers and shippers were agreed that no rates should be prescribed for distances less than 40 mi. to allow the carriers to make rates to meet motor-truck competition. At a special meeting of the general committee of the Central Freight Assn., held Jan. 26, 1926, a scale of rates on coarse aggregates in Ohio was approved by the carriers. This scale was published in the minutes or Proceedings of Special Meeting, 923, and became known as the PSM 923 scale. This scale has generally been observed as a maximum scale and no evidence was introduced showing the amount of traffic moved on this basis. This scale, which provides for no joint-line arbitrary, is shown following the examiner's findings, which are:

(1) That the rates assailed on crushed stone in car-loads, from Hillsville, Shaw Jct., and Walford, Pa., and the rates assailed on slag in car-loads, from Midland and Sharpsville, and from Weirton, W. Va., to destinations in Ohio, are and for the future will be unreasonable to the extent that they exceed or may exceed the rates made by the use of PSM 923 distance scale appearing in the appendix.

(2) That the intrastate rates in Ohio on crushed stone, gravel, sand and slag in car-loads, for transportation in open-top cars, unjustly discriminate against interstate commerce, and are and for the future will be unduly preferential of shippers in Ohio and unduly prejudicial to the complaining shippers in West Virginia and in western Pennsylvania, to the extent that: (a) To destinations in Ohio other than those hereinafter indicated by paragraph (b) the said intrastate rates are or may be lower

than the distance scale of rates shown in the appendix as PSM 923 scale: Provided that rates to Toledo and Cleveland and vicinity from origins in Ohio and from plants operated by complainants in West Virginia and in western Pennsylvania shall be on a level 10 c. per ton lower than this scale; that this paragraph shall not apply to distances of 40 mi. and less; and that reasonable groups of points of origin and destination may be made. (b) To destinations in Ohio located within 40 mi. of the plants operated by complainants at Weirton, W. Va., and at Hillsville, Midland, Shaw Jct., Sharpsville and Walford, Pa., the said intrastate rates are lower, distance considered, than the rates on crushed stone and slag contemporaneously in effect to those destinations from the said plants of complainants.

(3) That distances should be computed over the shortest routes via connections for the interchange of carload traffic, embracing as a maximum the lines of not more than three line-haul carriers.

	West Pennsylvania Scale		PSM
Miles	Single	Joint	923
20	60	80	60
25	70	90	65
30	70	90	70
35	70	90	75
40	70	90	80
45	80	100	80
50	80	100	85
55	80	100	85
60	80	100	90
65	90	110	90
70	90	110	95
75	90	110	95
80	90	110	100
85	100	120	100
90	100	120	100
95	100	120	105
100	100	120	105
105	110	130	105
110	110	130	115
125	110	130	115
150	120	140	125
175	130	150	135
200	140	160	145

I. C. C. Docket No. 25,020, rates on crushed stone, sand, gravel and slag within Ohio; No. 24,597, Bessemer Limestone & Cement Co. *v.* A. & B. B. *et al;* No. 24,597, Sub. No. 1, Carbon Limestone Co. *v.* Same; No. 24,597, Sub. No. 2, Lake Erie Limestone Co. *v.* Same; No. 24,597, Sub. No. 3, Standard Slag Co. *v.* Same; No. 24,597, Sub. No. 4, Union Limestone Co. *v.* Same.

New Complaints Filed

Crushed Stone.—The commission has suspended from Aug. 18 until Mar. 18, 1933, schedules in Sup. 42, 43 and 44 to Pennsylvania Railroad I. C. C. 182, proposing to reduce the rates on crushed stone, agricultural limestone, quarry scrap stone, rip-rap stone, stone screenings and stone tailings in car-loads, from Greencastle, Ind., to Maroa, Ill., via the Pennsylvania, from $1.01 to 88 c. per net ton.—I. & S. Docket No. 3,790.

Rate-Committee Dockets

New England Freight Assn.

Sand and Gravel.—To meet competition of near sand-and-gravel pits and thus secure traffic to the rail carrier, shippers propose that the rate on sand and gravel,[1] from No. Wilbraham and Westfield, Mass., to Chatham, N. Y., be reduced from $1.00 to 80 c. per net ton.—Docket No. 26,226.

Trunk-Line Assn.

Amiesite.—Shippers propose the establishment of a rate on crushed stone coated with oil tar or asphaltum,[1] from Martinsburg, W. Va., to West Union, W. Va., of $1.70 per net ton.—Docket No. 29,668.

Lime.—Carriers propose to establish on (a) building lime, car-load minimum weight 36,000 lb., and on (b) agricultural or chemical lime, car-load minimum weight 30,000 lb., from Carson and Karo, Va., to L. & H. Ry. Stations, Mayville, N. Y., to Buttzville, N. J., inclusive rates of (a) 19½ c. and (b) 19 c. per 100 lb. —Docket No. 29,677.

Sand.—Shippers of glass sand at Triplett-Gore, Va., propose the establishment of rates on that commodity[1] to all points in C. F. A. territory to which rates are published from Mapleton, Pa., and Berkeley Springs, W. Va., as per Agent Curlett's I. C. C. A-306, made by the addition of 15 c. per ton to the rates from Mapleton and Berkeley Springs.—Docket No. 29,671.

Carriers propose to establish rates on sand,[1] from Raritan River R. R. stations and Perth Amboy district to Ottawa, Ont., on the basis of 2 c. per 100 lb., under Toms River, N. J.—Docket No. 29,286, Sup. 2 (cancels Sup. 1.)

Central Freight Assn.

Crushed Stone.—Carriers propose to reduce the rates on crushed stone from Milltown, Ind., to various destinations in Illinois. Representative proposed rates per net ton are: To Edgewood, $1.28; Hubbard, $1.15; Sacramento, $1.20; Flat Rock, $1.15; Lawrenceville, $1.10; Salem, $1.30; Christopher, $1.35; Edgewood, $1.30 and to Woodlawn, $1.25.—Docket No. 32,587.

Carriers propose to publish a rate of $1.45 per net ton on crushed stone from Narlo, O., to Neffs and St. Clairsville, O., via N. K. P.—W. & L. E.—Docket No. 32,644.

Shippers propose a reduction in the rate per net ton on crushed stone to Blakesley, O., from Huntington, Ind., from 99 c. to 80 c., and from Whitehouse, O., from 80 c. to 75 c.—Docket No. 32,502.

Fluxing Stone.—A proportional rate of 76 c. per gross ton on fluxing stone ex-lake from Painesville and Perry, O., to Lorain, O., is proposed by shippers.

Carriers propose to cancel the rate of $1.41 per gross ton on fluxing stone from Fultonham and White Cottage, O., to Mansfield, O., allowing the intermediate application to apply. —Docket No. 32,579.

A reduction in the rate on raw dolomite and fluxing stone ex-lake from Painesville and Perry, O., to Mingo Jct., Steubenville, Toronto, O., and Weirton, W. Va., from $1.39 to $1.13 per gross ton is proposed by shippers. —Docket No. 32,585.

Shippers propose a reduction in the rate on fluxing stone in open-top cars, from Bedford, Coxton, Heltonville and Oolithic, Ind., to Portsmouth, O., from $1.76 to $1.53 per gross ton.—Docket No. 32,612.

Ground Flint.—Shippers propose the establishment of a commodity rate on ground flint[1] from Cox, Ill., to Flint, Mich., of $3.28 per net ton. —Docket No. 32,606.

Ground Limestone.—Shippers at Bedford, Ind., seek the establishment of a through rate on ground limestone, car-load minimum weight 50,000 lb., to Jacksonville, Fla., of $3.80 per net ton.—Docket No. 32,560.

Sand.—A reduction in the rate on industrial sands from Bremen, O., to Louisville, Ky., from $2.77 to $2.52 is sought by shippers.—Docket No. 32,581.

Sand and Gravel.—Carriers propose the publication of the following rates on sand and gravel from Newtown and Gravel Pit, O., to Rosedale, Spring Lake, Maurice, Ludlow and Highland, Ky., 80 c. and to Independence, Ky., 85 c. per net ton.—Docket No. 32,550.

Carriers propose to reduce the rate on sand and gravel from Hamilton to Xenia, O., from $1.20 to 70 c. per net ton.—Docket No. 32,564.

Shippers have asked for a reduction in the rate on common sand and gravel from Cleveland, O., to Johnstown, Pa., to $1.60 per net ton.—Docket No. 32,584.

Carriers propose to reduce the rate on common sand and gravel from Saegertown, Pa., to Conneautville and Springboro, Pa., from 90 c. to 70 c. and to Albion, Pa., from 90 c. to 80 c. per net ton.—Docket No. 32,610.

A reduction in the rate on sand and gravel in open-top cars from Dresden, O., to Lancaster, O., from 90 c. to 70 c. per net ton is proposed by shippers.—Docket No. 32,638.

Shippers propose a reduction in the rate on common sand and gravel from Fremont, O., to Fostoria, O., from 70 c. to 60 c. per net ton.—Docket No. 32,608.

Soapstone.—Shippers are asking for the publication of a rate on crude ground soapstone or talc, car-load minimum weight 40,000 lb., from Cincinnati, O., to Holland, Mich., of 18 c. per 100 lb.—Docket No. 32,528.

The following rates per 100 lb. on crude ground soapstone or talc, carload minimum weight 40,000 lb., all re-

(*Continued on page 52*)

Latest Portland-Cement Statistics

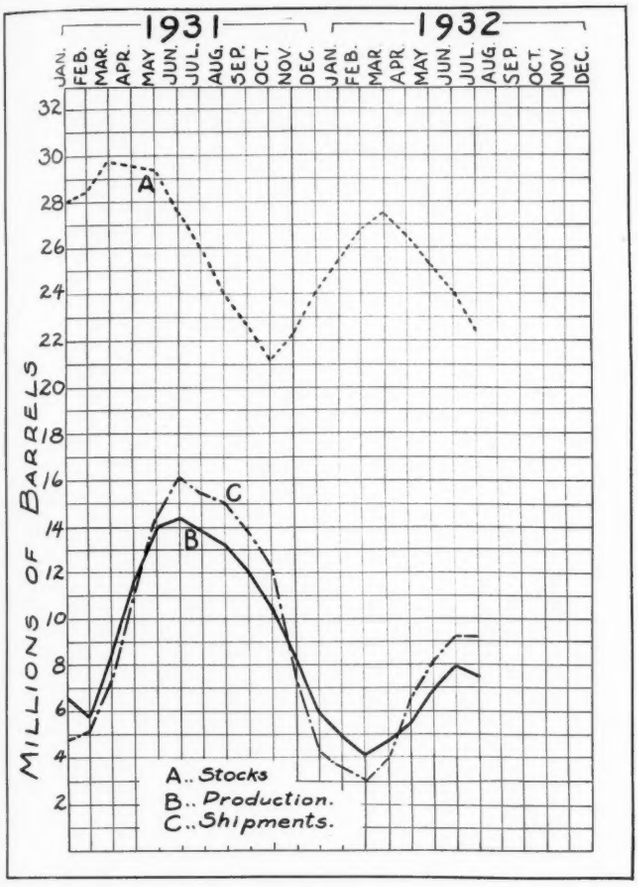


Chart showing monthly production, shipments and stocks on hand at end of month, from January, 1931, to July, 1932.

THE Portland-cement industry in July, 1932, produced 7,659,000 bbl., shipped 9,215,000 bbl. from the mills, and had in stock at the end of the month 22,479,000 bbl. Production of Portland cement in July, 1932, showed a decrease of 44.9 per cent. and shipments a decrease of 40.7 per cent., as compared with July, 1931. Portland-cement stocks at mills were 13.3 per cent. lower than a year ago. The statistics here given are compiled from reports for July, received by the Bureau of Mines, from all manufacturing plants except three, for which estimates have been included in lieu of actual returns.

In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of July, 1932, and of July, 1931.

DISTRIBUTION OF CEMENT

Shipped to—	June		First Six Months	
	1931	1932	1931	1932
Alabama	138,369	30,451	909,543	193,159
Alaska	1,100	2,689	4,480	5,736
Arizona	41,110	16,050	257,497	88,475
Arkansas	177,846	18,623	734,020	104,874
California	646,220	461,266	3,733,806	2,477,561
Colorado	99,511	66,933	390,118	248,376
Connecticut	166,357	91,086	657,033	405,264
Delaware	51,926	34,906	173,013	139,322
District of Columbia	141,277	88,395	577,598	478,994
Florida	95,649	36,600	414,132	196,275
Georgia	183,317	100,778	839,179	568,686
Hawaii	22,996	23,787	147,263	125,423
Idaho	25,547	10,241	95,367	49,974
Illinois	1,069,134	815,496	3,371,090	2,186,081
Indiana	616,508	410,735	1,603,603	1,057,393
Iowa	779,351	257,084	1,926,479	675,032
Kansas	300,175	159,469	1,129,098	533,253
Kentucky	215,082	87,771	872,635	451,425
Louisiana	422,388	129,428	1,520,723	479,974
Maine	90,276	84,934	217,891	166,098
Maryland	230,317	148,637	834,944	662,358
Massachusetts	318,456	253,183	1,248,665	962,750
Michigan	842,129	488,650	2,443,326	1,254,890
Minnesota	625,439	588,156	1,578,769	1,219,218
Mississippi	82,243	21,757	316,999	115,814
Missouri	500,949	456,782	2,001,262	1,429,023
Montana	35,590	14,670	129,402	60,264
Nebraska	272,654	86,063	764,987	279,719
Nevada	11,041	74,982	52,252	206,344
New Hampshire	43,410	21,685	142,276	85,122
New Jersey	508,242	310,676	2,123,201	1,391,260
New Mexico	29,840	16,937	154,113	102,342
New York	2,498,158	1,287,121	8,351,021	4,997,825
North Carolina	163,922	30,921	599,236	253,860
North Dakota	55,251	24,936	159,594	73,539
Ohio	817,720	525,399	2,694,684	1,731,373
Oklahoma	290,304	105,703	1,213,929	620,428
Oregon	109,997	40,056	479,663	279,169
Pennsylvania	866,697	461,699	3,492,133	2,043,240
Porto Rico	17,385	4,350	28,427	23,921
Rhode Island	66,438	36,789	271,706	151,126
South Carolina	224,825	50,320	1,309,654	270,421
South Dakota	110,088	28,654	300,568	95,437
Tennessee	162,661	88,321	693,669	416,823
Texas	586,255	333,082	2,774,537	2,020,701
Utah	43,516	9,655	153,814	65,872
Vermont	42,905	38,453	102,097	89,610
Virginia	193,085	82,323	800,686	444,098
Washington	226,264	167,838	1,128,786	705,166
West Virginia	184,176	101,063	584,668	390,235
Wisconsin	569,655	394,935	1,561,114	964,135
Wyoming	19,781	10,467	69,716	36,033
Unspecified	1,246	11,394	66,155	67,880
	16,034,778	9,242,279	58,200,621	34,141,371
Foreign countries	42,222	21,721	218,379	162,629
Total shipped from cement plants	16,077,000	9,264,000	58,419,000	34,304,000

RELATION OF PRODUCTION TO CAPACITY

	July		June	May	April
	1931 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)
The month	62.0	33.4	35.7	30.2	24.8
The 12 months ended	53.8	34.2	36.5	38.9	41.7

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1931	1932	1931	1932		1931	1932	1931	1932
January	8,129	6,107	10,384	8,184	July	12,246	6,613	10,209	7,881
February	7,473	5,176	11,946	9,375	August	11,664	.....	8,468	.....
March	9,586	5,443	13,318	10,025	September	10,414	.....	6,918	.....
April	11,540	5,924	13,854	10,511	October	9,825	.....	6,021	.....
May	13,159	6,273	13,087	9,922	November	8,259	.....	6,215	.....
June	12,679	6,803	11,837	8,877	December	6,840	.....	7,035	.....

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1931	1932	1931	1932	1931	1932
January	6,595	5,026	4,692	3,393	27,759	25,778
February	5,920	3,971	5,074	3,118	28,612	26,657
March	8,245	4,847	7,192	3,973	29,676	27,545
April	11,245	5,478	11,184	6,536	29,715	26,496
May	14,010	6,913	14,200	8,020	29,554	25,394
June	14,118	7,921	16,077	9,264	27,602	24,035
July	13,899	7,659	15,545	9,215	25,934	22,479
August	13,549	.....	15,172	.....	24,313	.....
September	12,092	.....	13,671	.....	22,736	.....
October	10,762	.....	12,360	.....	21,218	.....
November	8,161	.....	7,156	.....	22,219	.....
December	5,974	.....	4,142	.....	24,098	.....
Totals	124,570	.....	126,465	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in JULY, 1931 and 1932 (*thousands of barrels*)

District	Production		Stocks at end of Month	
	1931	1932	1931	1932
Eastern Pa., N. J., and Md.	2,537	1,174	1,593	1,113
New York and Maine	1,047	640	940	599
Ohio, Western Pa., and W. Va.	1,339	574	1,262	826
Michigan	610	427	1,049	1,074
Wis., Ill., Ind., and Ky.	1,574	883	1,199	746
Va., Tenn., Ala., Ga., Fla., and La.	1,281	320	685	434
Eastern Mo., Ia., Minn., and S. Dak.	1,159	1,032	710	505
W. Mo., Neb., Kan., Okla., and Ark.	935	587	622	589
Texas	675	245	310	257
Colo., Mont., Utah, Wyo., and Idaho.	212	182	285	217
California	588	401	1,290	1,303
Oreg. and Wash.	289	148	264	218
Totals	12,246	6,613	10,209	7,881

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JULY, 1931 AND 1932, AND STOCKS IN JUNE, 1932 (*thousands of barrels*)

District	July						Stocks at End of June 1932
	Production		Shipments		Stocks at End of Month		
	1931	1932	1931	1932	1931	1932	
Eastern Pa., N. J., and Md.	2,675	1,162	3,114	1,741	6,026	4,553	5,132
New York and Maine	1,192	809	1,436	860	1,669	1,647	1,697
Ohio, Western Pa., and W. Va.	1,520	582	1,471	790	3,559	2,680	2,889
Michigan	983	571	1,147	644	2,208	2,007	2,080
Wis., Ill., Ind., and Ky.	1,877	1,144	2,275	1,666	3,518	2,750	3,272
Va., Tenn., Ala., Ga., Fla., and La.	1,319	322	1,210	493	1,576	1,659	1,830
Eastern Mo., Ia., Minn., and S. Dak.	1,414	1,143	1,896	1,439	2,762	2,921	3,218
W. Mo., Neb., Kan., Okla., and Ark.	1,015	789	1,102	511	1,624	1,547	1,269
Texas	646	278	696	307	626	667	695
Colo., Mont., Utah, Wyo., and Idaho.	219	111	229	99	609	419	407
California	670	584	624	510	1,158	1,049	975
Oreg. and Wash.	369	164	345	155	599	580	571
Totals	13,899	7,659	15,545	9,215	25,934	22,479	24,035

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	Exports				Imports			
	1931		1932		1931		1932	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	41,199	$115,678	36,704	$82,984	95,609	$120,298	14,375	$16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	30,123	69,451	53,333	58,576	59,392	41,487
May	48,028	140,953	31,634	71,048	19,325	20,568	9,223	7,358
June	43,597	107,610	33,134	72,084	32,079	42,955	20,963	15,496
July	29,344	97,837	.....	.....	14,332	15,582	.....	.....
August	39,517	106,643	.....	.....	8,895	11,739	.....	.....
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
Totals	429,653	1,220,600	.....	.....	457,238	507,918	.....	.....

Sales of Cement in First Six Months Show Wide Price Variations

Portland-cement prices the country over during the first six months of the year 1932 are estimated to have averaged $1.02 per bbl., according to figures collected by the United States Bureau of Mines from 158 plants, representing about 95 per cent. of the industry in the United States.

The lowest average price was obtained by the 11 plants in Wisconsin, Illinois, Indiana and Kentucky, the average in this section being but 75 c. per bbl. Highest prices were recorded by the 9 mills in Oregon and Washington, these having shipped 920,000 bbl. having an estimated value of $1,831,000—or an average of $1.99 per bbl.

The price average in the Lehigh Valley district, greatest of all producing districts in the United States, was 96 c. per bbl.

The accompanying table shows the shipments by producing districts for the half-year period and the estimated value in each instance.

District	Shipments (First Six Months of 1932)		
	Plants Shipping	Quantity (*bbl.*)	Estimated Value
Eastern Pa., N. J., and Md.	24	8,209,000	$ 7,810,000
New York and Maine	11	2,783,000	2,888,000
Ohio, Western Pa., and W. Va.	19	2,760,000	2,477,000
Michigan	13	1,721,000	1,593,000
Wis., Ill., Ind., and Ky.	11	3,805,000	2,843,000
Va., Tenn., Ala., Ga., Fla., and La.	19	2,789,000	3,184,000
Eastern Mo., Ia., Minn., and S. Dak.	11	3,469,000	2,991,000
W. Mo., Nebr., Kans., Okla., and Ark.	13	2,487,000	2,075,000
Texas	9	1,892,000	2,272,000
Colo., Mont., Utah, Wyo., and Idaho	9	512,000	800,000
California	10	2,957,000	4,135,000
Oreg. and Wash.	9	920,000	1,831,000
	158	34,304,000	$34,899,000

Production Resumed at Kelley Island Quarries

More than 120 men have been given employment at the Kelley Island quarries of the Kelley Island Lime & Transport Co. of Cleveland, O., following the resumption of production there. The steamers, *Amazon* and *Amaritana*, are to transport rock to ports on the mainland. The Kelley Island quarries had been on a part-time operating basis for more than a year.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Lehigh Pays Preferred Dividends from Surplus

Lehigh Portland Cement Co. has declared the regular quarterly dividend of $1.75 on the company's preferred stock, payable October 1 to stock of record September 14.

C. C. Long, secretary, stated:

"In view of the substantial impairment to surplus and current available resources of the company within the past year it is apparent that improvement in the earnings of the company, which will be possible only in the event of increased volume, must in the future determine dividend action on the preferred stock."

Although Lehigh's statement for the twelve months ended June 30, 1932, showed a loss, after provision for depletion, depreciation and obsolescence, of $484,020, the operation of the company for the second quarter of 1932 alone resulted in a loss of $408,386.

All preferred dividends for the calendar year ended December 31, 1931, amounting to $1,404,439, were paid out of surplus.

New Asbestos Securities Certificates Ready Soon

Dr. C. W. Colby and Kenneth Dawes, both of Montreal, have been named vice-presidents of Asbestos Corp. of Montreal, Canada.

With the issuance of supplementary letters patent, reorganization of the company has now reached completion. Certificates of new securities will be mailed to security holders during the course of next month.

French Cement Earnings Are Surprisingly Stable

Earnings of French cement companies, expressed in francs as well as approximately in United States dollars at the current rate of exchange, have been reported as follows:

Etablissements Poliet et Chausson has declared a dividend of 80 francs for the year 1931, with a net profit of 24,541,281 francs ($96,000,000). This compares with a dividend of 120 francs in 1930, when the net profit was 32,657,814 francs ($128,000,000).

S.A. des Chaux et Ciments de Lafarge et du Teil has declared a dividend of 69.10 francs on its "A" shares and 59.10 francs on its "B" shares for the year 1931, with a net profit of 22,615,193 francs ($89,000,000). The net profit for 1930 was 17,384,573 francs ($68,000,000), when the same dividends were paid.

Soc. Nouvelle des Chaux et Ciments H. de Villeneuve had a trading profit of 428,942 francs ($16,000) in 1931. The trading profit for the previous year was 574,721 francs ($22,000).

S.A. des Ciments Portland "La Desvroise" has declared a dividend of 150 francs for 1931, with a net profit of 2,007,905 francs ($80,000). This compares with a dividend of 275 francs in 1930 when the net profit was 4,452,383 francs ($165,000).

Soc. des Ciments et Chaux Hydrauliques du Nord has declared a dividend of 20 francs gross for the year 1931, against 45 francs gross for 1930.

S.A. des Ciments Portland Artificiels d'Origny-St.-Benoite has declared a dividend of 200 francs gross for the year 1931 compared with 300 francs gross for the year 1930. The net profit for 1931 was 6,022,907 francs ($240,000) compared with 12,013,333 francs ($475,000) for 1930.

Chaux Hydrauliques et Ciments du Vermandois showed a net profit for the year 1931 of 194,743 francs ($7,500), compared with 400,111 francs ($15,000) for 1930.

Soc. des Ciments et Chaux de Neufchatel reports a trading profit of 2,050,618 francs ($80,000) for 1931 compared with 2,769,002 francs ($105,000) for 1930. The cement sales increased from 38,805 tons in 1930 to 39,973 tons in 1931.

Soc. des Ciments Français has maintained its dividend of 250 francs for 1931. The net profit for 1931 was 17,967,836 francs ($700,000) compared with 17,262,595 francs ($675,000) in 1930. The output of cement was 673,423 tons in 1931 compared with 662,477 tons in 1930.

Protective Committee to Seek Deposit of Bonds

A protective committee for holders of the Bessemer Limestone & Cement Co. first-mortgage bonds has been organized with William R. Daley of Otis & Co., as chairman. The company defaulted interest on its bonds, due August 1, 1932.

In a letter mailed to bondholders the committee stated that it was hoped that the affairs of the company could be worked out for the benefit of the bondholders without the necessity of a reorganization, merger or sale of the assets of the corporation. The Dollar Savings & Trust Co., Youngstown, is depositary and the Guardian Trust Co., Cleveland, sub-depositary for the committee.

September 15, 1932, has been set as the final date for deposit of bonds under the agreement.

Charles Schmutz, former vice-president and sales manager of the Bessemer Limestone & Cement Co., Youngstown, O., has been elected president and general manager of the company. He succeeds L. A. Beeghley, who in turn has been elected chairman of the board of directors. Mr. Schmutz was one of the executive officers of the old Bessemer company before it was taken over by the Beeghley interests.

Canada Cement Company Defers Dividend Action

Directors of Canada Cement Co., Ltd., at a meeting August 25 at Montreal, decided to defer payment of the accumulative preference dividend due September 30. An official statement said:

"Operations of the company during the present season have been on a considerably reduced scale owing to depressed condition of building industry. While any marked improvement in general business would probably soon be reflected in increased building activity, it is considered advisable in the meantime to maintain the liquid position of the company by deferring dividend payments."

DIVIDENDS DECLARED AND AWAITING PAYMENT

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Preferred	$1.75 qr.	Sept. 1	Sept. 15	Riverside Portland Cement	1st Pfd.	$1.50 qr.	July 15	Aug. 1
Cleveland Quarries	Special	$0.50 qr.	Aug. 10	Sept. 1	Superior Portland Cement	Class A	$0.27½M	Aug. 23	Sept. 1
Cleveland Quarries	Common	$0.10 qr.	Aug. 15	Sept. 1	Superior Portland Cement	Class B	$0.12½	June 15	July 20
Consolidated Sand & Gravel	Preferred	$0.50 qr.	July 30	Aug. 15	Texas Gulf Sulphur	Common	$0.50 qr.	Sept. 1	Sept. 15
Fitzsimons & Connell	Common	$0.25 qr.	Aug. 20	Sept. 1	U. S. Gypsum	Preferred	$1.75 qr.	Sept. 15	Oct. 1
International Salt	Common	$0.37½ qr.	Sept. 15	Oct. 1	U. S. Gypsum	Common	$0.40 qr.	Sept. 15	Oct. 1
Lehigh Portland Cement	Preferred	$1.75 qr.	Sept. 14	Oct. 1	Worcester Salt	Preferred	$1.50 qr.	Aug. 4	Aug. 15

Foreign Developments

Industrial Importance of Research in Gypsum

From the research on gypsum within recent years, the author summarizes the following as particularly significant to the industry:

The compounds of calcium sulphate known at present are the double hydrate (gypsum, rock gypsum) $CaSO_4.2H_2O$; the hemi-hydrate (stucco) $CaSO_4.\frac{1}{2}H_2O$; the semi-anhydride $CaSO_4$ (according to D'Ans, hardens; formed at a temperature under 240 deg. C.); the soluble anhydride $CaSO_4$ (according to van't Hoff, hardens), and anhydride $CaSO_4$ (does not harden; of natural origin or formed at high temperature) (D'Ans, *Tonindustrie-Zeitung* 1932, No. 29, 387).

The temperatures at which these combinations are chemically altered are largely dependent on the vapor tension prevailing. The water of hydration can only escape from combination when the pressure of the free water vapor on the gypsum is less than pressure tending to drive off the water of hydration. This dissociating pressure is for the first 1½ mols of water at 107 deg. C. 971 mm. mercury-column, about corresponding to the pressure of steam at this temperature. For the last ½ mol of water the dissociating pressure corresponds to the steam pressure at 93 deg. C. (588 mm. mercury-column). For anhydride the conversion temperature is 63.5 deg. C., corresponding to 175 mm. mercury-column. This explains both the varying temperatures ascertained by investigators as necessary for the conversion, the temperatures being dependent on the vapor pressures existing at the time, and also the favorable effect of removing the steam as it is formed in the production of stucco. (*Tonindustrie-Zeitung*, 1929, No. 80,1425). The fact that the conversion temperature of anhydride is lower than that of the hemi-hydrate also shows why in the calcining process overburned portions (anhydride) are easily formed. On the other hand, the interior of large pieces is often not dehydrated, because of the poor heat-conducting properties of gypsum; thus stucco from either the kettle or the rotary kiln commonly contains considerable portions both of double hydrate and of anhydride.

These facts are taken into account in a new process for the calcining of gypsum. Some years ago it was proposed (Ambroso Lawrence, American patent 745,067, 1902) to introduce compressed air into the kettle, but this received little attention. Recently a different process has been developed, in which the calcining is done along with the grinding; hot air introduced into the mill effects the necessary calcining temperature, and an air current continually removes both the vapor from dehydration and the fine particles of hemi-hydrate.

Hemi-hydrate takes up water slowly from the air to a total water content of 8 per cent, but hardening semi-anhydride takes up water quickly to a content of 6.2 per cent (hemi-hydrate). The hemi-hydrate yields supersaturated solutions, the content decreasing with higher temperatures. If a double-hydrate crystal is introduced, crystals of the double hydrate are formed until the concentration reaches the content of the saturated solution (2.1 grams per liter); to this fact must be ascribed the rapid hardening of stucco containing unburned portions.

In spite of this crystallization of interlocking needles, to which alone the hardening of gypsum has previously been ascribed, it has also been observed that before the beginning of this crystallization a colloidal mass is also formed (Cavazzi, *Koll. Zeitschr.* 12, 196, 1913; Traube, ibid., 25, 65, 1919); a colloidal hardening process is accordingly proposed by these observers. On the basis of the colloidal hardening Traube has patented a process for diffusing streams of salts into the colloidal mass to produce agate structures, different colors being effected by different salts.

As in the case of other materials, the reactivity of gypsum is increased by fine grinding. In this way it has been possible to make natural anhydride capable of hardening, by grinding it to 0.06 mm., in Hartner's German patent 312,239 (1917). The hardening capacity was considerably increased by the addition of lime and particularly of acid sodium-sulfate, these substances acting only at catalysts (Budnikoff-Syrkin, *Chem. Ztg.* 47, 22, 1929).

The long known fact that addition of lime increases the strength of gypsum has led recently to attempts to produce a hydraulic binder from gypsum (Honus, *Zement* 16, 1229, 1927). Mixtures of finely ground limestone and rock gypsum (about 70 per cent lime) were heated to 600 to 850 deg. C. and afterwards again ground. This material hardened, varying with the raw materials used, in a half to two and a half hours, and in 1:3 mortars gave strengths of 100 to 200 kg./sq. cm. after 31 days.

Calcined lime and raw gypsum mixed need only to be heated to 60 to 65 deg. C. in order to start the simultaneous dehydrating of the gypsum and slaking of the lime (Martin, *Tonindustrie-Zeitung*, 1930, No. 69, 1130). Further investigations should illumine the properties of such lime and gypsum mixtures.—Prof. V. Rodt in *Tonindustrie-Zeitung* 56:659-660, June 27, 1932.

Tricalcium-Silicate Is Found by X-Ray Studies

Several years ago the authors disputed the existence of tricalcium-silicate, and R. H. Bogue furnished them with specimens of preparations he designated as β-dicalcium-silicate and tricalcium-silicate. Studying them by the X-ray it was found that the tricalcium-silicate yielded a diagram corresponding to the authors' own β-dicalcium-silicate, while the other specimen gave a diagram as yet unknown to them; at first they suspected an error in labeling the samples, but analysis showed that the labeling was correct. The authors then analyze their own dicalcium-silicate, which had not previously been done because the preparation had been fused from known quantities of lime and silica. This analysis brought out the interesting fact that the loss in silica by volatilizing was greater than had been anticipated, and that the portions previously considered β-dicalcium-silicate were really tricalcium-silicate. The identity is confirmed by the X-ray study, and has the worthwhile effect of bringing the authors' conclusions into agreement with those of other investigators, and of putting the existence of tricalcium-silicate beyond question.—Prof. Dr.-Ing. Ernst Jänecke and Dr. R. Brill in *Zement* 21:380-381, June 30, 1932.

Determine Relation of 7-Day to 28-Day Test

It is often impossible or impractical to wait for the results of the 28-day mortar tests, and for this reason alone the ratio between the 7-day and the 28-day tests is of considerable practical value. This ratio depends among other things on the size of the mortar specimens and from the way they are handled. So for the present note only those figures were used which were given by tests made under equivalent conditions: cubical specimen as customary in Germany, storage 7 days in water and 21 days in the air, temperature 15 to 20 deg. C. The figures of course varied within fairly wide limits, but by plotting a great number on a chart it was possible to obtain coherent limitations for the minimum and maximum of the ratio. The minimum value (compressive strength) at 28 days was thus found to be 1.2 times the 7-day strength; the maximum 1.7 times the 7-day strength plus 60 kg./sq. cm. This is a lowering of the lower limit below that previously stated by the author (1.4).—Otto Graf in *Zement* 21:386, June 30, 1932.

Recent Patents

AMERICAN

Cement and Concrete

Concrete-mixing, spreading, and finishing machine. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,869,902.

Apparatus for handling cement or like material in bulk. Morris Kind, Bryn Mawr, Pa., assignor to Hercules Cement Corp., Philadelphia, Pa. No. 1,869,970.

Machine for unloading cement. Alton K. Frederick, Osborn, O., assignor to Southwestern Portland Cement Co., same place. No. 1,869,679.

Crushing and Grinding

Disintegrating mill. Samuel K. Nester, Geneva, N. Y. No. 1,871,127.

Drilling

Power-operated rock-drill. Edward J. Warren, Denver, Colo. No. 1,869,875.

Excavating

Adjustment means for bucket lines. William M. Venable, Pittsburgh, Pa., assignor to Blaw-Knox Co., same place. No. 1,869,989.

Dipper tooth. Jacob W. Fellmeth, Danville, Ill. No. 1,870,044.

Excavating bucket. Francis H. Hunt, Leonia, N. J., assignor to Raymond Concrete Pile Co., New York, N. Y. No. 1,870,050.

Excavating bucket. Judson Hayward, Hackensack, N. J., and Herman J. Brendlin, New York, N. Y., assignors to Hayward Co., New York, N. Y. No. 1,870,288.

Miscellaneous

Mine car. Clarence A. Boyd, Barnesville, O., assignor to Watt Car & Wheel Co., same place. No. 1,870,167.

Skip hoist. Gerald J. Oldroyd, Philadelphia, Pa., assignor to Link-Belt Co., Chicago, Ill. No. 1,870,962.

Mining machine. Frank A. Lindgren, Western Springs, Ill., assignor to Goodman Mfg. Co., Chicago, Ill. No. 1,871.186.

FOREIGN

Blasting and Explosives

Blasting cartridge. S. G. Frantz, Princeton, N. J. German 553,904.

Explosives. E. I. duPont de Nemours & Co. British 375,824.

Cement

Cement burning. H. Engel, Stettin, Germany. German 553,616 (addition to 548,663).

Cement mixtures for use as plastering or surfacing masses. The Cement Marketing Co., Ltd., H. Keeble and H. N. Wrigley, London, England. German 553,360.

Preparation of raw materials for cement. G. Polysins Akt.-Ges., Dessau, Germany. German 555,691.

Colored building cements or concretes of the Portland type. Cement Marketing Co., Ltd., H. Keeble and H. N. Wrigley. British 375,838.

Concrete and Concrete Products

Track beds of concrete. W. P. Day, Cleveland Heights, O. German 554,240.

Artificial stone, concrete and similar building materials made with boiler-house cinders. H. Hock, Berlin-Wilmersdorf, Germany. German 554,548.

Concrete floors and ceilings. Concrete, Ltd., J. G. Ambrose and C. B. Matthews. British 375,797.

Method of and means for building with reinforced concrete, cement, plaster, or the like. J. H. de W. Waller. British 376,259.

Crushing and Grinding

Crusher. Traylor Engineering and Manufacturing Co., assignee of Richard Bernhard, Allentown, Pa. Canadian 324,195.

Safety device or coupling for the driving of crushing or like apparatus. H. H. Bailey and J. E. Bailey. British 376,017.

Drilling

Drilling and similar rotary tools. J. Denz. British 376,126.

Feeding devices for percussive tools. W. W. Triggs (Ingersoll-Rand Co.) British 376,575.

Material-Handling

Driving mechanism for reciprocating or shaker conveyors. R. A. Walter. British 375,901.

Safety devices for cranes and the like. A. F. Nash. British 376,282.

Grab buckets. E. V. P. Dyggve. British 376,527.

Control device for operating dump-cars. R. Gauthier. British 376,648.

Crane hoist-control. Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of Willard G. Cook, Wilkinsburg, Pa. Canadian 324,525.

Shaker conveyors. Tage G. Nyborg and Mark F. Higgins, Worcester, England. Canadian 324,625.

Screening and Separating

Removal of particles from gases by means of alternating magnetic fields. Siemens-Schuckertwerke Akt.-Ges., Berlin-Siemensstadt, Germany. German 554,642.

Vibrating screens. F. Krupp Grusonwerk Akt.-Ges. British 375,934.

Screens or sieves. Strachan & Henshaw, Ltd., T. Sargent and G. W. Grossmith. British 375,957.

Screening apparatus. W. Ross. British 376,273.

Screening apparatus. W. S. Tyler Co., Cleveland, assignee of Morley P. Reynolds, Cleveland Heights, Ohio. Canadian 324,394.

Separation of dry materials. Colin W. H. Holmes, Low Fell, and Birtley Iron Co., Ltd., Birtley, England. Canadian 324,621, 324,622 and 324,623.

Unclassified

Production of a refractory mortar. Scheidhauer & Giessing Akt.-Ges., Bonn a. Rh., Germany. German 553,395 and 554,455.

Treatment of fluorspar. Hilscher und Saline Ludwigshalle, Wimpfen a. N., Germany. German 554,365.

Production of a calcined potash that does not harden in storage. Kali-Chemie Akt.-Ges., Berlin. German 554,142.

Treatment of raw sulphur. K. Wolfes, Dortmund, Germany. German 554,293.

Production of refractory silica-mortar. H. Koppers Akt.-Ges., Essen, Germany. German 553,484.

Production of a silica-bearing material for silica mortar. Dr. C. Otto & Co., G. m. b. H., Bochum, Germany. German 554,205 (addition to 549,262).

Artificial marble. E. Revelant, Aurisina, Triest, G. Sormani, Milan, and G. Barone, Luino, Italy. German 553,779.

Production of active silica. R. Defris, Vienna, and E. Deisenhammer, Langenzersdorf near Vienna, Austria. German 555,401.

Weatherproofing of building units. B. Redlich, Feldkirchen near Munich, Germany. German 554,995.

Production of silica bricks. Hermann Salmang and Benno Wentz, Aachen, Germany. German 555,767.

Manufacture of slabs or panels in imitation of marble or other materials. N. E. Newman. British 376,284.

Powdered-fuel feeding apparatus. Ward L. Fickey, Sioux City, Iowa. Canadian 324,244.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Explosives Plant Adds Power-Unit Equipment

Installation of new boilers and modern power equipment and construction of additional power housing facilities at its Kenvil, N. J. explosives plant is announced by Hercules Powder Co.

Funds totalling $135,000 have been appropriated for the project which will proceed at once, according to George E. Ramer, the company's chief engineer. The improvements are being made at this time because of the economies that will be effected in operation and because of the present low prices of materials, labor, and equipment, it is stated.

Manufacturers' Publications

Copies of any of these publications may be had by writing the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Crushers

Material Crushers. 8 p. (The Patterson Foundry & Machine Co., East Liverpool, O.) The novel mechanical action of the Gyro-Centric crusher is described and illustrated in a simple yet thorough manner. According to the circular, the crusher insures high-speed operation without high-speed wear, positive reduction with a minimum of fines, and vast production without choking.

Engines, Diesel

Caterpillar D-9900 Engine. (Caterpillar Tractor Co., Peoria, Ill.) Describes and illustrates a new stationary Diesel engine unit for industrial service with a normal governed speed of 700 r.p.m. The engine is of the solid injection - precombustion type with 6⅛-in. bore and 9¼-in. stroke and a displacement of 1,090 cu. in.

Excavating

The New Williams Champion. Folder. (The Wellman Engineering Co., Cleveland, O.) Describes and illustrates a new clam-shell bucket for which the manufacturers claim increased digging power, greater speed and low upkeep cost.

Motors, Electric

G. E. Squirrel-Cage Motors. 4 p. (Bull. No. 1628. General Electric Co., Schenectady, N. Y.) Describes briefly the wide use to which the popular squirrel-cage motor is being put, and illustrates some of its applications and mechanical details. Control equipment for this type of motor is also described and pictured.

Pumps

Byron Jackson Sand, Gravel and Rock Pumps. 8 p. (Bull. No. 322. Byron Jackson Co., Berkeley, Cal.) Describes and illustrates a line of centrifugal pumps for dredging and kindred service. Contains tables for determining capacities, etc., as well as drawings illustrating the arrangement of the various styles of pumps. One of the features of the pumps is the use of two- and three-port non-clogging impellers having large openings to permit the easy passage of large pieces.

Safety Appliances

Protective Footwear—A New Line of Safety Shoes and Pacs. 4 p. (Bull. No. 115 Mine Safety Appliances Co., Pittsburgh, Pa.) A new bulletin describing and illustrating a line of safety shoes and white rubber pacs for quarry and plant workers. The toes of the footwear are of the true safety type to guard the worker from foot injuries due to falling rock, tools, etc.

Screens

Jigger Vibrating Screens. 20 p. (Bull No. 732. Productive Equipment Corp., Chicago, Ill.) A new bulletin describing the vibrating screens made by this concern. Features include variable vibration, full-floating, soft shoe mountings and noiseless operation. The booklet also features two new screen developments, the automatic cleaner and the "fluffer," by which the screen becomes entirely self-cleaning and automatic and through which the smallest particles in finely-divided materials are broken up.

Boilers, Process-Steam

Electric-Heated Steam Boilers. 12 p. (Bull. No. 41. Commonwealth Electric & Mfg. Co., Boston, Mass.) Describes and illustrates a new line of small steam boilers, electrically-heated, for generating process steam.

Weight Recorders

Comparison of Cost Between Hand Weighing and Automatic Motion Weighing. 4 p. (Streeter-Amet Co., Chicago, Ill.) An interesting leaflet showing a comparison of hand-weighing methods against automatic weight-recording while in motion, made on railway cars.

Pumpings from the Old Pit

Fifteen Years Ago

NEW firms just entering business included the United Quarries Co., of Sandusky, O.; the Silica Sand Co., of Michigan City, Ind.; the Concrete Gravel Co., of Wilmington, Del.; and the Columbus Gravel Co., of Columbus, O.

* * *

Joseph W. Webb, who had been connected with the management of the plant of the Lincoln Sand & Gravel Co., at Lincoln, Ill., resigned to become sales manager of the Northern Gravel Co., at Muscatine, Ia.

Ten Years Ago

TEXAS producers were up in arms over the enforcement of the state's new truck law limiting the weights of loaded trucks operating over public highways. A test case had gone to the supreme court for a ruling on the law's constitutionality. If the law were upheld, operators would be forced to use small trucks, seriously affecting future profits.

* * *

Indiana plants were operating at capacity and were receiving good prices for materials. The car shortage which was being felt nationally made it difficult to move products as rapidly as they could be produced, however.

* * *

The constitutional convention of the National Assn. of Sand and Gravel Producers, scheduled for September, 1922, in Chicago was postponed until December.

* * *

An appeal for their just share of railroad cars was filed by the Wisconsin Mineral Aggregate Assn., on behalf of the state's producers, with the Interstate Commerce Commission at Washington.

Five Years Ago

FIRE caused $150,000 damage when it destroyed the plant at Plaster City, Cal., of the Pacific Portland Cement Co. Plans were immediately made for its rebuilding.

* * *

The National Lime & Stone Co. had its new plant at Carey, O., under construction.

* * *

Six additional slurry tanks were installed at the Concrete, Wash., mill of Superior Portland Cement, Inc. The new tanks had a capacity of 18,000 bbl. of raw slurry and increased the number in service at the operation to twelve.

New Machinery and Supplies

Stationary Model Diesel Engine Is Now Available

The Diesel engine that has been developed by the Caterpillar Tractor Co., after seven years of intensive research, is now available as a stationary engine.

This engine has a 6⅛-in. bore, 9¼-in. stroke, and is governed at 700 r.p.m., developing better than 85 hp. It has four cylinders, is 4-cycle, and uses the solid injection fuel system, and a pre-combustion chamber.

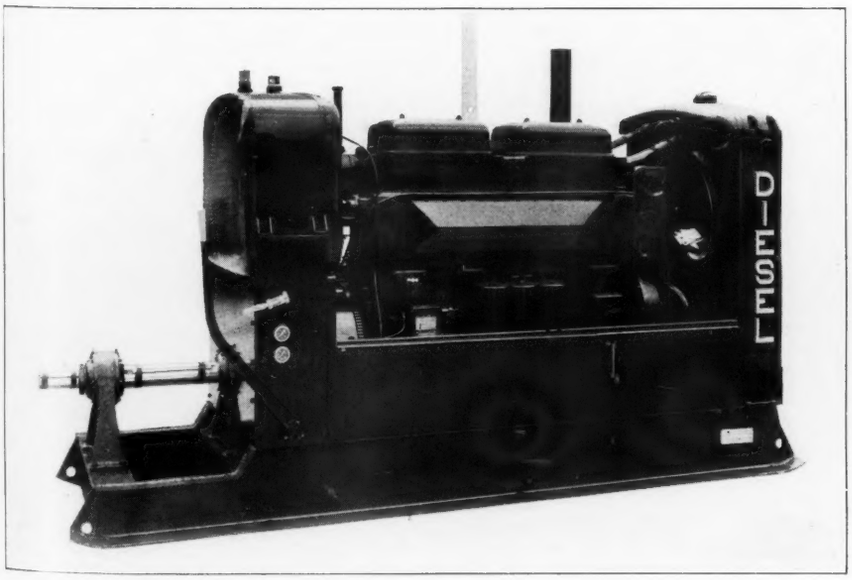
The solid injection method of handling fuel oil is by means of individual pumps mounted on each cylinder. These are accurately calibrated and sealed at the factory, thereby preserving the intended settings under operating conditions.

The fuel injectors have a single orifice of .086 dia. (2.3 mm.). A self-cleaning pintle keeps this orifice from clogging and maintains its prescribed dimension.

The fuel is first injected into a pre-combustion chamber, where it is ignited by heat generated by high compression.

This pre-combustion chamber prepares the fuel for the main combustion chamber in the form of a partly-burned rich, dry mixture, carrying no wet slugs, and therefore minimizing crankcase dilution and preserving lubrication on cylinder walls. Another quality is the fact that this pre-combustion chamber permits burning a wide range of fuels.

The engine is provided with a positive starting mechanism—a small 2-cyl., 4-cycle gasoline engine, mounted on the side of the Diesel itself. The engine is water cooled, being connected to the Diesel cooling system. The exhaust gases of this starting engine warm the Diesel intake for ease in starting. The starting energy is imparted to the Diesel engine through a clutch and Bendix drive to the Diesel flywheel.



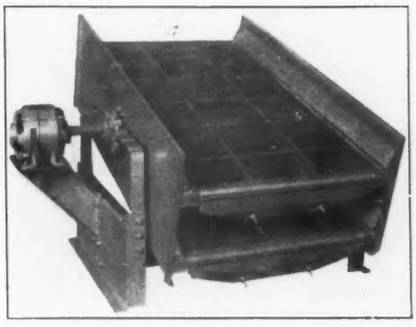
Diesel power unit with hood and doors removed.

New Vibrator Designed to Do Fine Screening

The Robins Conveying Belt Co., makers of the well-known Gyrex and Vibrex screens, recently placed on the market another model known as the Whippet, in answer to the demand for a high-capacity, low-priced unit for fine screening.

The bodily vibration of a rigid screen surface with positive uniform "circle throw" motion has been demonstrated to be the most successful and universal screening action yet devised. Now the Whippet screen brings "circle throw" screening to the fine-screening field. But more than that, it brings with it not only running adjustment of amplitude, but also high speed. It, moreover, embodies in a low-priced screening unit the following features, most of which are entirely new (1) high speed "circle throw" motion, positive and uniform throughout the screen surface, (2) phenomenally low-power consumption, (3) running adjustment of amplitude, (4) running adjustment of slope of screen, (5) screen-cloth mounting suitable for metal or silk screens, (6) end tension of screen surface, (7) subdivided arching of screen surface, (8) interchangeable pre-tensioned panels, and (9) sealed-oil lubrication.

The Whippet is a typical Robins vibrating screen, in that it employs the sound fundamentals of screen design;



Double-deck fine-sizing screen.

a live frame with mesh rigidly tensioned and supported—a centrally located vibrator to obtain uniform positive motion—the conventional three-unit assembly, consisting of base frame, live frame and vibrator. Beyond these familiar points of similarity, the Whippet branches out into important novel features of its own.

The principle of operation of the vibrator is altogether new. The vibrator itself is a compact self-contained unit, sturdy yet precise in construction, in which the ball-bearings and the hardened steel raceways for the "floating eccentrics" are constantly bathed in oil. The oil is sealed in and requires renewal only at long intervals.

The method of mounting and tensioning the screen cloth so as to secure the proper rigidity without tearing the mesh represents another unique line of development.

The method of spring support, simple though it is, embodies novel principles for permitting the free vibration of the screen frame and yet effectively insulating the supports from all trace of escaping vibration.

New Lightweight Mixer Mounted on Ford Truck

A new truck mixer of 1-cu.yd. capacity, which may also be used as an agitator in transporting pre-mixed concrete, has recently been introduced by the Leach Co., Oshkosh, Wis. The mixer, mounted on a standard Ford truck chassis, is of the revolving drum type. It is considerably lighter than most truck mixers. In spite of this light weight, all-steel construction plus skilful design make it a strong, rugged unit.

The mixer body is driven by a power take-off on the 1-cu.yd. model. The company is also supplying this job in 2- and 3-cu.yd. models, these being powered by separate engines.

The mixer drum is non-reversible and discharges in the same rotation as for mixing. This simplifies control and operation and eliminates consider-

The light weight 1-cu. yd. truck mixer.

able reverse-gear mechanism. The discharge door is self-cleaning and of the cone type. It opens and closes by means of a thrust lever located conveniently so the operator can discharge the batch while standing on the ground. Batches may be cut at will by regulating the lever.

The mixer employs an automatic siphon water-tank, so that no pre-mixing is necessary. The tank is filled to the top at the start of each trip and the operator in the cab releases the exact amount of water into the mixer by pulling a convenient cord. As soon as the water level drops down to the level set by the regulator the siphon flow breaks and the water instantly ceases to flow.

Rope Lubricant Resists Heat, Strand Friction

Hodson's cable lubricant is a special development, completed after a number of years of study of wire rope. It has a plastic body, is very tough, heavy, and exceedingly adhesive. It will not solidify at the lowest temperatures, therefore it will not crack or scale off a cable. Neither will it become soft enough in the hottest weather to drip off a cable at any climatic temperature.

The lubricant is highly resistant to high temperatures. During the warmest summer weather, the body of this material remains heavy enough so that it can be pulled from a drum, more or less like a rope.

The toughness and plasticity of this lubricant makes it valuable for filling up the spaces between the wires in the strand, providing a supply of lubricant, whose life has not yet been determined. The tough, adhesive qualities make it stick tenaciously to the surface of the individual wires, providing lubrication to meet the conditions encountered when the rope goes over sheaves and is under the strain of heavy loads.

Hodson's cable lubricants are being successfully used on all types of haulage and transmission ropes, hoisting ropes, logging ropes and track cables. The heat resisting qualities make it very desirable where it is used under high temperatures that are either operating or climatic. It is marketed by the Macwhyte Co. of Kenosha, Wis., manufacturers of preformed wire rope.

Improvements Add Life to Drag-Line Buckets

Harnischfeger Corp., Milwaukee, Wis., has recently improved its line of P&H drag-line buckets.

Made in sizes from ⅝-cu.yd. capacity to 4-cu.yd. capacity, P&H drag-line buckets are of combination riveted and welded construction, giving ample strength with minimum weight. As the shell of the bucket is welded together the construction eliminates projecting rivet heads, permitting the bucket to "scour" easily. The dump sheave is simple and trouble free. The cable cannot slip off. Because of the self-oiling bearing the sheave requires infrequent attention. The spreader bar is made of angle bars riveted into a box-section with white oak filler, making it particularly resistant to end compression.

The bucket shell is built up of heavy tank steel. The bottom and sides are cut from a single piece, with the back welded into position. A heavy strip of steel is welded around the upper edge of the bucket to give it additional strength. Four forged renewable wearing shoes are also welded to the bottom to take care of wear from the bucket shell.

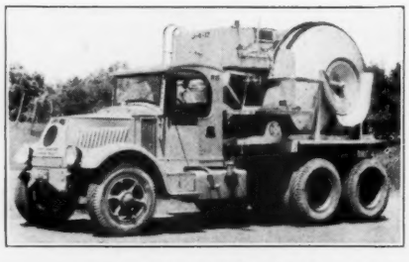
The cutting lip, which is readily renewable, is an exceptionally heavy piece of forged boiler plate extending well up the sides of the bucket and securely fastened with countersunk rivets. Bucket teeth are special manganese steel castings, riveted through the lip and bottom of the shell. The teeth points are renewable and reversible.

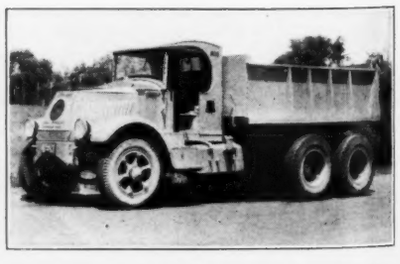
Pump Handles Volume of Liquids at High Speeds

For handling relatively large volumes of liquid against comparatively low heads, the propeller type of pump can be operated at rotative speeds which are much higher than those suitable for ordinary centrifugal pumps. The liquid flows through the pump in smooth lines, without abrupt turns or change of direction. In a properly designed pump of this type, the liquid enters and leaves without turbulence or shock and the efficiency is high.

The De Laval propeller pump which is here shown is built for both horizontal and vertical installation and is available for all capacities and for heads up to about 40 ft. It is suitable

Dump Truck Convertible to Mixer

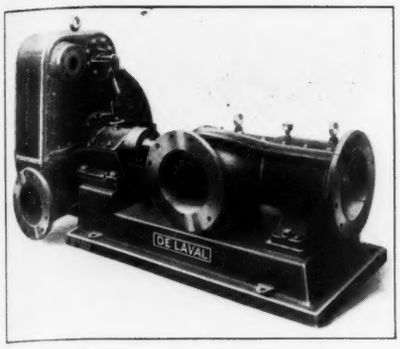




The eleven Mack Model AK, 6-cyl., 6-wheel trucks recently delivered to B. Perini & Sons, prominent contractors of Framingham, Mass., are versatile units—dump trucks one day, concrete mixers the next.

As dump trucks they average 11 cu. yd. to the load. When concrete is ready to be poured, the dump bodies and hoists are easily removed and new-type 5-cu.yd. Jaeger mixer bodies are mounted on the chassis.

B. Perini & Sons are one of the oldest firms in New England, having been in the business since the early days when wheelbarrows and tip carts were used. Among the recent jobs they have handled are the paving of three sections of the Boston & Worcester Turnpike, involving over $3,000,000.



The propeller pump.

for direct connection to a standard speed electric motor or steam turbine, or a speed reducing gear may be used, according to conditions.

The pump casing consists of two parts, which are separated in the plane of the center line of the shaft by a flat joint, that is maintained air and water tight by a thin paper gasket. The pump case cover can be lifted off to render the propeller and all interior parts accessible. The propeller is designed for the specified conditions of capacity, head and speed, and is finished on all surfaces, the blades being carefully filed and scraped to templates to insure the shape required by hydraulic design. The casing around the propeller is protected by a separate sleeve, which can be renewed should wear occur. This sleeve supports the guide vanes by which the liquid is directed in smooth flow-lines. The shaft is protected from wear by a removable protecting sleeve which extends through the stuffing box and provides a bearing surface for the packing.

At the coupling end the shaft is supported by a grease lubricated ball bearing with a separate ball thrust bearing in the same housing. At the propeller end, the shaft is supported by a bearing of the sleeve type. The stuffing box is designed for soft packing, with a lantern ring to facilitate water sealing where desired. The gland is split and can be removed without disturbing the other parts.

New Blasting Explosive Is of Low-Density Type

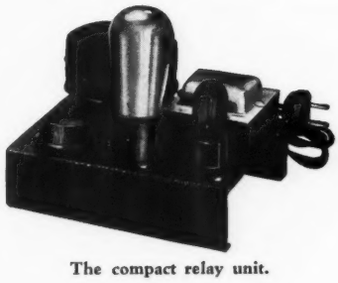
Apex No. 1, a new rock explosive, is announced by the Atlas Power Co. as an economical substitute for the more expensive, high-strength explosives heretofore used in quarrying.

Apex is a high explosive of the low density type, provided for quarry blasting. It is developed in line with the need for an explosive of the dynamite type which upon detonation creates a force capable of gaining greater purchase on the burden.

Observation of the rock production from the use of straight nitroglycerine, gelatin, and ammonium nitrate explosives has proven rather conclusively that their force is often of too violent a nature. Effective disruption of brittle rocks is possible with the use of fast-acting and powerful explosives, but most formations actually quarried disclosed the presence of highly resilient rock below the plane of weathering. The disruption of this more resilient rock demands the use of a force which will take hold and stress the rock slowly but surely beyond its elastic limit. This is the kind of force that Apex is especially developed to give. It generates a force of low violence as regards shattering action but of sufficient power to destroy the crystalline nature of rock. Ideal fragmentation, controlled throw of debris, limited back break, and more tons of rock per pound of powder used are secured.

Photoëlectric Relay an Ideal Automatic Control

A new, low-cost photoëlectric relay, the Foto-Switch, is announced by G-M Laboratories, Inc., Chicago, Ill. This unit embodies an electro-magnetic switch which is opened or closed by the interruption of variation in the illumination on the photoëlectric cell. With the Foto-Switch, any sort of electrical device, such as motors,



The compact relay unit.

lights, signals, or alarms, can be controlled through the medium of a light beam.

Photoëlectric equipment is used to control many manufacturing operations. This device may be used as a limit switch, as a bin-level indicator or control, and for regulating the flow of such products as crushed stone, gravel, coal, etc.

Full information on the Foto-Switch and available accessories can be obtained from G-M Laboratories, Inc.

Mill-Type Starters for Constant-Speed Motors

A new line of general purpose mill-type starters for constant-speed direct-current motors has been announced by the General Electric Co. These starters utilize newly developed accelerating contactors which have been designed not only to act in the capacity of a relay to provide time delay, but also to short out the starting resistor by means of a contact finger. The new accelerating contactor, therefore, replaces two conventional devices; namely, the accelerating relay and the old accelerating contactor.

The new starters are very sturdy, and embody unusual mechanical and electrical simplicity, thereby cutting maintenance cost to a minimum. The accelerating contactors are equipped with silver-faced tips so as to eliminate oxidation difficulties in instances where the motor operates steadily for long periods.

The new general purpose mill-type starters are available in sizes from 1 hp. up to 75 hp. Each starter mounts the following devices:

1 line contactor, equipped with interlock for undervoltage protection (when used with momentary contact start button).
1 to 3 magnetic time accelerating contactors.
1 thermal overload relay.
1 starting resistor.
1 sheet metal enclosing case, ventilated, adapted for wall mounting.

Pump Takes Concrete to Job Through Pipe-Line

For the first time in America concrete was pumped to the forms in quantity when the Pumpcrete, owned by the Chain Belt Co., went into action on the Thirty-fifth St. Viaduct in Milwaukee, on August 11, 1932.

Pumpcrete is a concrete pump, developed in Europe for delivering concrete to the forms by direct pumping action, and apparently is the successful solution to a method of placement by direct pumping that has long interested concrete engineers.

The Milwaukee demonstration lasted twelve hours, during which the Pumpcrete handled 125 cu.yd. of ready-mixed concrete to forms, including 1½ hr. idle time waiting for delivery.

The pump is of the piston type, gasoline or electric motor driven, and has a capacity of 15 to 20 cu.yd. of concrete per hr., and is portable. It will transport concrete 500 ft. horizontally, or up to 72 ft. vertically.

In the Milwaukee test, the concrete of the standard mix being used on the

The concrete as discharged. The workman is rodding it into the forms.

Mixer truck chuting concrete to the pump. Pipe-line at right.

project was delivered in Moto-Mixers to the hopper of the pump, the gasoline motor was started and the Pumpcrete started on its highly successful test that was to run through the full working day and well into the night. The concrete, as it was delivered to the forms, was rigidly inspected, and its quality, if changed at all, was said to be somewhat improved.

Five-inch pipe was employed in the pipe line and the aggregates of relatively large size were moved through it, all day long, without a bobble. The pipe used was in 10-ft. lengths, equipped with quick couplings.

The Pumpcrete is to be manufactured and distributed in America by the Chain Belt Co. of Milwaukee, which has purchased the American manufacturing rights from the German-Dutch combination who developed it and patented it throughout the world.

Spotlight Puts Stop to Thefts at Cement Plant

Installation of a police-boat type of searchlight by the Trinity Portland Cement Co. caused the cessation recently of a series of nocturnal thefts of valuable company property. The night watchman had been prevented in his attempts to prevent the stealing by threats from the thieves.

Cable and any other equipment which could be sold were removed in open defiance of the watchman. A large amount of copper had been taken from a 2300-v. transmission line, and also rubber-covered portable cable. On one occasion the watchman had come upon three men taking portable cable and, as he approached one of them, the other two took positions on either side of him while the trio ordered him on his way.

General Electric Co. engineers suggested the use of a searchlight. Accordingly a Novalux searchlight of the type used on police boats was installed on top of a small building situated on a hill and thus commanding a view of all sections of the property. The light is controlled from inside the building, and can be turned in any direction.

The watchman now stays in the tower all night, punching a clock at regular intervals. He very readily spots the beam, by the feel of the

Searchlight on control tower in the Trinity quarry.

handle, with light off, on any point in the quarry he wishes to check. He then turns the light on with the beam already directed. Thus, if anybody were at the point in question, he would be taken unawares.

A rifle completes the watchman's equipment. Nothing has been lost from the quarry since the installation of the light.

Traffic (*From page 42*)

ductions, are sought by shippers. From Cincinnati, O., to Akron, O., and Cleveland, O., 13 c.; to Detroit, Mich., 14½ c.; to Youngstown O., 15 c.—Docket No. 32,570.

Western Trunk-Line Committee

Crushed Stone, Sand and Gravel.—The following scale is proposed not as a mileage scale, but for use in determining specific rates for single-line application for the purpose of meeting motor-truck competition between points in Kansas on chatt, crushed stone, sand and gravel [1]. The present one-line scale and the Nebraska scale are also shown.—Docket No. 1,873-O.

Miles	Present One-Line	Proposed One-Line	Present Nebraska
10	50	50	40
20	56	50	40
25	62	50	40
30	62	55	45
40	68	55	45
50	74	60	50
60	80	65	55
70	85	70	60
80	90	80	70
90	95	90	80
100	100	95	90

Roasted Dolomite.—It is proposed to establish a rate of 27 c. on roasted dolomite, car-load minimum weight 60,000 lb., from Granite City, Ill., to Steelton, Minn.—Docket No. 1,241-D, Sup. 1.

Southern Freight Assn.

Cement, Lime and Plaster.—Between points in Tennessee it is proposed to alternate on cement, lime and plaster, the basis published in Item No. 62, Exceptions to Southern Classification, Agent Dulaney's I. C. C. No. 40, with the rates published to apply on building material, not wooden, in Commodity Description No. 9, shown on p. 12 of Agent Glenn's Knoxville Tariff, I. C. C. No. A-501.

Ground Limestone.—The original docket covering the establishment of rates on ground limestone, from Cartersville, Ga., to Boston, Mass., and New York, N. Y., is amended as follows: (1) The proposed rate to Boston, Mass., and New York, N. Y., will not apply to other points taking the same rates, but to these points proper. (2) The suggested rates to apply on the following description: "Stone, viz., limestone or marble, ground or pulverized to fineness to pass through a screen of 200 meshes to the inch, in bulk, in bags or barrels, car-load minimum weight 60,000 lb." (3) Rates: To New York, $5.94 per ton; to Boston, $6.79 per ton.—Docket No. 57,-790, Amdt. 1.

Sand.—Shippers have asked for publication of a commodity rate on glass sand,[1] from Enterprise, Ky., to Kingsport, Tenn. Carriers suggest a rate of $1.96 per net ton.—Docket No. 58,811.

Southwestern Freight Bureau

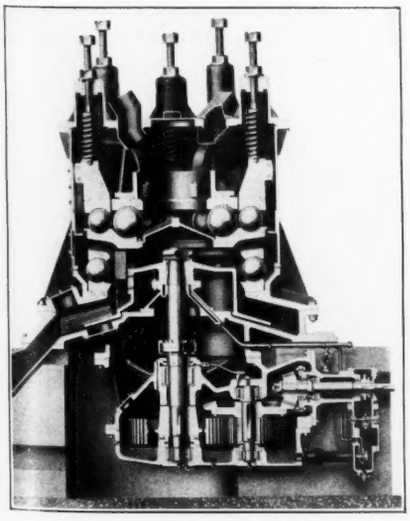
Dolomite.—A shipper at Genoa, O., is asking for the publication of a rate on raw dolomite and fluxing stone,[1] from East St. Louis, Ill., to Henryetta, Okla., of $2.50 per net ton. The proposed rate is based on the scale published in S. W. L. Tariff 162, on ground limestone.—Docket No. 25,369.

[1] The car-load minimum weight will be 90 per cent. of the marked capacity of the car, except that when the car is loaded to its full cubical or visible capacity, the actual weight will apply.

A New Pulverizer for Closed-Circuit Raw-Material Grinding

THE development of a new pulverizer is announced by The Babcock & Wilcox Co., New York, N. Y. It is claimed that the mill, which operates in closed-circuit with a mechanical air classifier, will pulverize cement raw material and similar products, as received from hammer mills, fine enough so that no further reduction is necessary before it enters the kilns. Thus preliminary reduction mills with their accessory elevators, feeders, conveyors, and storage bins used heretofore may be eliminated. It is also claimed that in many plants, because of the low power consumption of the new mill and the elimination of the power-consuming equipment now used in preliminary reduction, the saving in power will be as great as 50 per cent. of that commonly used.

The manufacturer states that the pulverizer has many important features and advantages that contribute to its successful performance and high efficiency. It is a further adaptation of the ball- and grinding-ring principle, which has been extensively used by the company in the past in its pulverizing mills, in that it provides for positive grinding pressure and means for its control, as well as also providing for a rapid and controlled flow of material between the grinding surfaces. A plurality of stages of pulverization by the ball- and grinding-ring principle are provided; regulating means are so arranged that the material flows rapidly through the grinding zones in a thin, evenly distributed layer which enables each ball to work efficiently over its entire travel. The control is such, however, that the fine material is quickly discharged from the mill and the cushioning effect, which would be present if fines were retained in the mill, is thereby eliminated. The application of this principle is not new in pulverizers built by the company, having been successfully used in more than a hundred mills pulverizing coal in leading power plants throughout the country.



Cross-section of pulverizer.

A distinctive feature claimed for the new mill is the manner in which the grinding pressure may be controlled to meet any conditions of grindability and so that a product of any fineness may be secured regardless of wear of the grinding elements.

The grinding elements are located in the lowest possible position in the mill, thus insuring quiet operation and freedom from vibration. The elements consist of three rows of large diameter balls together with three stationary and one rotating grinding ring. The rows of balls—two upper and one lower—are separated and propelled by the rotating grinding ring, which is driven by means of a yoke fastened to the main drive-shaft. Although this method of driving the grinding elements is positive it is also non-rigid because adequate provision has been made in the design whereby the rotating grinding ring "floats" on the driving yoke. Provision has also been made to insure full contact between the driving faces of the yoke and the rotating ring irrespective of wear of the grinding ring or balls.

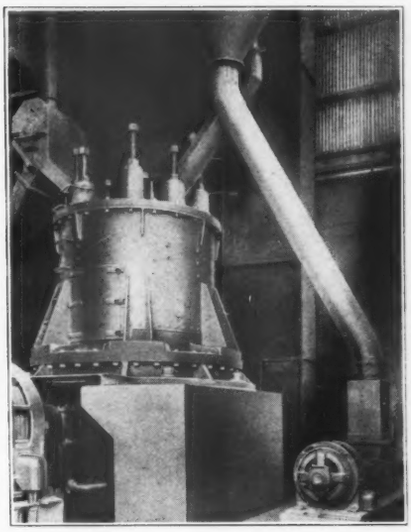
The grinding pressure is applied to each upper row of balls by heavy steel springs that bear directly on the separate top grinding rings. Pressure exerted by the springs on the upper grinding elements is transmitted to the lower row of balls through the rotating grinding ring. The springs are securely held in place by means of guides and heavy steel screws.

The openings for the feed and tailings spouts, and the steel housings that support the spring adjusting screws, are in the top cover plate of the grinding chamber. The grinding zone is made accessible for inspection or cleaning by simply opening a large hinged door in the casing, or by removing a large manhole cover in the top cover plate.

The intermediate section forms a rigid support for the mill. The annular compartment in which the pulverized material collects as it leaves the lower row of grinding balls is in this part of the mill. The driving yoke to which are attached a number of sweeps for removing the finished product through the discharge opening rotates in this compartment.

The base contains the entire driving mechanism, including the main shaft and thrust bearings, gear assembly, and the force-feed oiling system. The main drive-shaft is supported by a self-aligning, heavy-duty thrust-bearing.

Power is applied to the grinding elements through a compact and efficient



Mill installation at plant of Whitehall Cement Mfg. Co.

double-reduction gear assembly. It consists of a set of bevel gears for the first reduction, and a set of spur gears for the second reduction. Both gear shafts are well supported by roller bearings.

Operation of the pulverizer is quite simple. Raw material from an overhead pin is fed by means of a poidometer or other feeder directly into the pulverizer through a feed spout. It is deposited into the center of the mill, and drops onto a table fastened to the rotating intermediate grinding ring.

Centrifugal action of the table throws the material outward into the path of the inner row of grinding balls. The material then passes to the outer row in which the second stage of pulverization takes place.

From the second stage, the material is discharged just outside the outer top row of grinding balls and passes through an adjustable ledge gap into the space below. Here it enters the path of the lower row of balls where the third stage of pulverization takes place.

Upon leaving the lower row of grinding balls, the pulverized material is discharged into an annular compartment which contains a number of sweeps. Here, due to the action of the sweeps, the material is rapidly discharged from the mill. It is then elevated to a mechanical air separator, which returns the oversize particles to the mill for further reduction and delivers the finished product to a Fuller Kinyon pump or screw conveyor.

The Austin-Western Road Machinery Co., domestic sales organization of The Austin Manufacturing Co. and The Western Wheeled Scraper Co., announces that it will handle the industrial sales and service of Cletrac crawler tractors in 24 states, broadly the territory covered by the Midwestern, Southern and Southeastern states.

Saving Through Safety

30 Gravel Plants Go Year Without Injury

By W. W. ADAMS
Chief Statistican
U. S. Bureau of Mines

THE third annual safety contest for plants producing sand and gravel, which was conducted in 1931 by the United States Bureau of Mines in cooperation with the National Sand & Gravel Assn., registered further progress in safety as compared with the two previous annual contests. Both the accident-frequency rate and the accident-severity rate were reduced.

The period covered was the calendar year 1931; 60 plants participated, and 17 states were represented by the participating companies.

The contest covered accidents and man-hours worked by all men at the participating plant who were employed by the same company; and it included work up to the point of delivery of the material directly to the consumer or to an independent agency of transportation—in other words, to the point of relinquishment of control of the material by the producer.

Reprinted from U. S. Bureau of Mines Report of Investigations 3186.

The purpose of the yearly contests for producers of sand and gravel is to aid in the promotion of safety among the employees and in the reduction of accident costs to the companies. The contests develop friendly rivalry among the various plants and among the employees of each individual plant in a concerted effort to prevent accidents.

Two safety trophies are awarded annually. One of the awards is for the best safety record among plants that were in operation during the contest year 100,000 or more man-hours; the other trophy is for the best record among plants that were in operation less than 100,000 man-hours. Awards and the relative standing of the various plants are based upon statistical compilation by the Bureau of Mines of accident reports and employment reports furnished by the enrolled companies. Company reports are summarized at the close of each year, and the summaries are submitted to each company concerned for certification as to the accuracy of the summary and the completeness of the company's reports from which the summary was prepared. When the summary is returned signed by an official of the company, the records are considered to be a trustworthy basis for determining the relative standing of the various plants. The position of each plant is determined by its accident-severity rate; that is, the number of days of disability resulting from accidents for each 1,000 man-hours of work done by all employees at the plant.

In measuring the number of days of disability resulting from accidents, 6,000 days are charged for each fatality. This figure has been used for many years in statistical studies of industrial accidents. It represents 20 years of 300 days each and was adopted as a fair approximation of the working expectancy of men of age 33, which was found to be the average age of men killed in industrial accidents. Permanent total disabilities are also given a time charge of 6,000 days. The charge for each permanent partial disability is a certain percentage of 6,000 days, depending upon the part of the body injured and the degree of disability. Temporary injuries are charged with the actual number of calendar days of disability, including Sundays, holidays, and other idle days if the incapacity of the injured employee actually continued on those days. The total number of days of disability thus determined is used in calculating accident-severity rates.

Among plants that worked 100,000 or more man-hours in 1931, the best safety record was that of the Van Sciver plant at Morrisville, Bucks County, Pa. This plant was operated by Warner Co., of Philadelphia, Pa. The Van Sciver plant is a lake-deposit operation, and its operations in 1931 covered 155,803 man-hours without a lost-time accident to any employee.

The trophy for the best safety record among plants that operated less than 100,000 man-hours was awarded to the Texas Construction Material Co., Houston, Tex., the award being based upon the safety record established by the company's Eagle Lake plant at Eagle Lake, Colorado County, Tex. The Eagle Lake plant is a wet-pit operation; it had no accidents in 1931 and its operations covered 86,847 man-hours.

While all member companies engaged in producing sand and gravel are eligible to enroll in the yearly safety contests, there being no requirement as to number of employees or period during which the plant must be in operation, the plant that works the largest number of man-hours and whose record is free of accidents is awarded the trophy in preference to the plant whose record is also free of accidents but whose operations covered a smaller number of man-hours of work. Of course, if no plant is free of accidents, the lowest accident-severity rate determines the winner.

TABLE I—ACCIDENT DATA FOR PLANTS COMPETING IN THE SAFETY CONTEST OF 1931, CLASSIFIED BY TYPE OF PLANT

Type of Plant	Number of Plants	Man-hours	Accident Rates	
			Frequency	Severity
Dry bank	9	486,439	43.171	1.558
Dry pit	6	129,508	30.886	.857
Wet pit	9	634,678	25.210	1.223
River	28	1,318,976	29.568	.682
Natural lake	3	308,142	6.491	.055
Wet pit and river	3	166,819	35.967	36.369
Wet pit and dry pit	2	98,293	81.389	.834
Total, 1931	60	3,142,855	30.545	2.771
Total, 1930	76	4,915,592	42.721	5.894
Total, 1929	26	2,259,572	74.350	9.713

TABLE II—ACCIDENTS CLASSIFIED BY SEVERITY OF INJURY

Type of Plant	Fatal	Permanent		Temporary	Total
		Total	Partial		
Dry bank	..	..	1	20	21
Dry pit	..	..	..	4	4
Wet pit	..	..	1	15	16
River	..	..	1	38	39
Natural lake	..	..	..	2	2
Wet pit and river	1	..	..	5	6
Wet pit and dry pit	..	..	..	8	8
Total, 1931	1	0	3	92	96
Total, 1930	4	0	2	204	210
Total, 1929	3	0	2	163	168

TABLE III—DAYS LOST CLASSIFIED BY SEVERITY OF INJURY

Type of Plant	Fatal	Permanent		Temporary	Total
		Total	Partial		
Dry bank	...	...	300	458	758
Dry pit	...	...	...	111	111
Wet pit	...	...	300	476	776
River	...	...	300	599	899
Natural lake	...	...	...	17	17
Wet pit and river	6,000	...	...	67	6,067
Wet pit and dry pit	...	...	...	82	82
Total, 1931	6,000	...	900	1,810	8,710
Total, 1930	24,000	...	900	4,072	28,972
Total, 1929	18,000	...	1,500	2,447	21,947

TABLE IV—CAUSES OF ACCIDENTS AT SAND AND GRAVEL PLANTS IN 1931

Cause	Dry Bank		Dry Pit		Wet Pit		River		Natural Lake		Wet Pit and River		Wet Pit and Dry Pit		Total	
	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost	Accidents	Days Lost
Machinery	7	608	...	...	2	317	9	373	...	...	...	...	2	28	20	1,326
Haulage	1	2	...	...	2	54	2	281	...	...	...	...	...	...	5	337
Explosions	...	...	1	7	...	...	...	...	...	...	1	33	...	...	2	40
Electricity	2	3	...	...	...	...	2	15	...	...	...	...	...	...	4	18
Fires	...	...	...	...	...	...	1	7	...	...	...	...	1	2	2	9
Hot substances	...	...	...	...	1	13	...	...	...	...	...	...	1	7	2	20
Falls of persons	2	9	1	25	4	177	9	95	1	14	3	31	1	38	21	389
Stepping on or striking against objects	2	18	...	...	1	11	3	54	...	...	1	3	1	5	8	91
Falling objects (not handled by injured)	...	...	1	69	...	...	1	4	...	...	...	...	1	1	3	74
Handling objects	4	94	1	10	2	77	7	41	1	3	1	6,000	...	...	16	6,225
Hand tools	3	24	...	...	2	14	4	15	...	...	...	...	1	1	10	54
Miscellaneous or causes not stated	...	...	...	...	2	113	1	14	...	...	...	...	...	...	3	127
Total	21	758	4	111	16	776	39	899	2	17	6	6,067	8	82	96	8,710

Of the plants enrolled in the contest, 30 had no lost-time accidents during the year. Twenty-nine of these plants were in the group whose operations were less than 100,000 man-hours. A certificate of merit is awarded to the operator of each plant which has a perfect safety record but which does not win the trophy because the winning companies work a larger number of man-hours.

As already stated, 60 plants participated in the contest in 1931; some plants enrolled early in the year and withdrew later because of shutdowns, or for some other reason. The 60 plants that remained in the contest worked 3,142,855 man-hours during the contest year; some of them, however, did very little work judging from the number of man-hours of employment. Ninety-six injuries were reported, including one injury that resulted fatally; the disability charge for all accidents combined was 8,710 days. If the single fatality is excluded the time charge is 2,710 days. The accident-frequency rate for all plants combined was 30.5 accidents per million man-hours of exposure, as compared with 42.7 for the previous year; the accident-severity rate for all plants was 2.8 days of disability for each thousand man-hours of exposure, as compared with 5.9 for the previous year.

The general scope of the safety contest of 1931 is indicated by the figures in Tables I, II and III.

Outstanding among the causes of accidents reported by the companies that participated in the 1931 safety contest were machinery and falls of persons. Handling objects ranked third and hand tools fourth. About 70 per cent. of the total number of injuries reported were chargeable to the four causes enumerated. Table IV shows the causes of accidents for each of the several types of sand-and-gravel plants.

From average figures covering two years of operations at lake plants and three years at other types of plants, the different types of sand-and-gravel plants rank as follows in relative safety from an accident-frequency viewpoint:

Type of plants	Accidents per million man-hours	Index (average 45.8 = 100%)
Lake	28.2	61.6
River	31.2	68.1
Dry pit	36.1	78.8
Wet pit	52.1	113.8
Dry bank	66.4	145.0
Average	45.8	100.0

From the standpoint of accident-frequency rate the class of plants that established the best 1931 record (excluding several plants whose operations could not be classified under a single type) was lake-deposit operations. Lake-deposit plants had an accident-frequency rate of 6.5 per million man-hours of work. This rate, which covered three plants only and was based upon 308,000 man-hours or work, appears unusually low when compared with the previous year's rate of 38.5, which covered four plants and represented 648,907 man-hours of work. Wet-pit operations ranked second in low accident-frequency rate among the different types of plants with a rate of 25.2; river plants ranked third with a rate of 29.6, dry pits fourth with a rate of 30.9, and dry banks fifth with a rate of 43.2.

Comparative rates for frequency and severity of accidents at different types of plants are given in Table V.

TABLE V—COMPARATIVE ACCIDENT DATA, CLASSIFIED BY TYPE OF PLANT

Type of Plant	Year	Number of Plants	Man-hours Worked	Frequency Rate	Severity Rate
Lake	1931	3	308,142	6.5	0.1
	1930	4	648,907	38.5	.4
River	1931	28	1,318,976	29.6	.7
	1930	35	1,925,899	30.1	3.8
	1929	3	121,403	65.9	.8
Dry pit	1931	6	129,508	30.9	.9
	1930	4	209,972	33.3	1.5
	1929	1	48,448	61.9	.9
Wet pit	1931	9	634,678	25.2	1.2
	1930	9	851,969	50.5	15.4
	1929	10	1,122,207	68.6	.7
Dry bank	1931	9	486,439	43.2	1.6
	1930	22	1,104,694	62.5	7.0
	1929	12	967,514	82.7	21.7

Safety Trophy Dedicated at Superior Cement Mill

Superior Portland Cement, Inc., celebrated the winning of the Portland Cement Assn. safety trophy in a big way at Concrete, Wash., on August 11.

The trophy, hidden behind a veil of American flags until the official dedication, was unveiled in the presence of the crowd by Mrs. Edwin P. Lucas, wife of the president of the company. The trophy was officially presented to the company by a representative of the Portland Cement Assn., and accepted on the part of the company by Harry A. Ambler, superintendent.

The trophy was formally dedicated by Roland H. Hartley, governor of Washington, who is greatly interested in safety work and came to Concrete to help the Superior company celebrate this event. At the conclusion of the governor's talk, James H. Kane, one of the directors of the company, who has been the principal speaker at almost every rally held since the safety movement was started at the plant, extended the congratulation of the officials to the employees over the success of the safety work. The company has now completed more than two years without a single accident entailing loss of time to any employee.

Through the efforts of Gordon Tongue, sales manager, a parchment over 300 years old was secured and on this was inscribed the names of all the employees who helped to make possible the winning of the trophy. This scroll was placed in a copper box and imbedded in the base of the trophy.

Following the dedication ceremonies, a dancing party and banquet were enjoyed by company officials, employees and guests.

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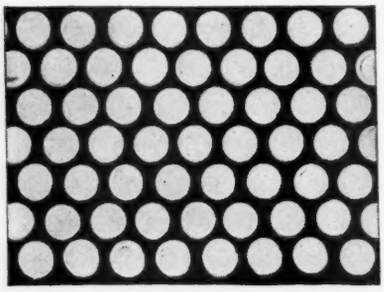

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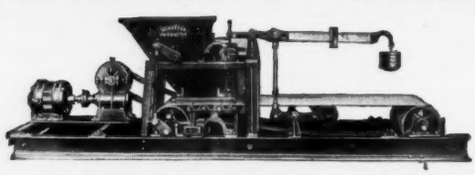

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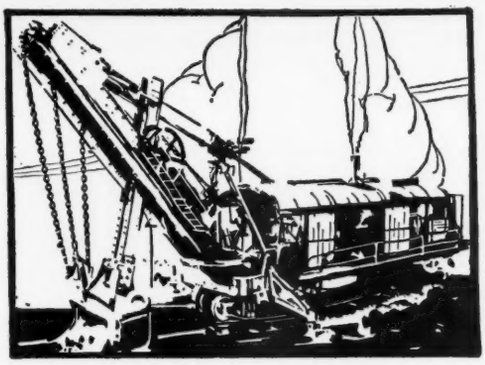

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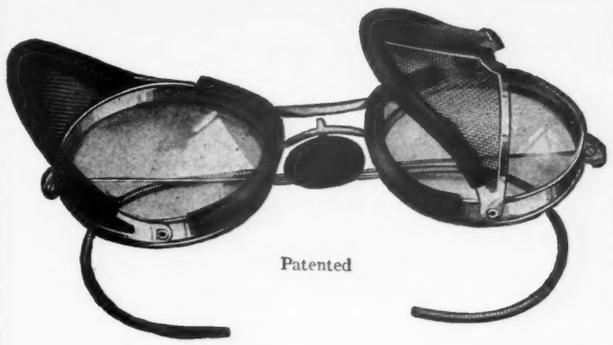

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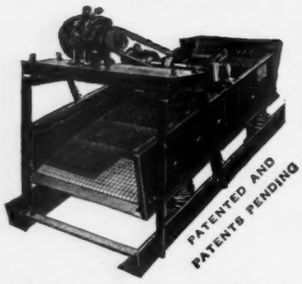

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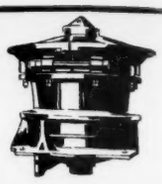

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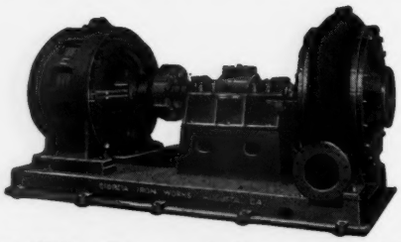

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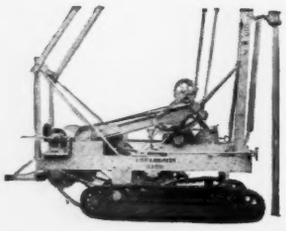

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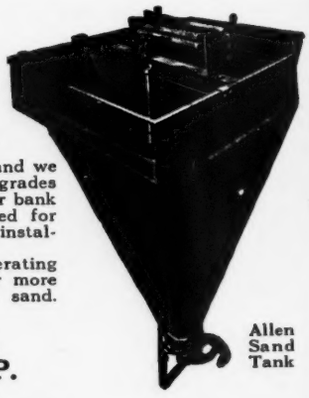
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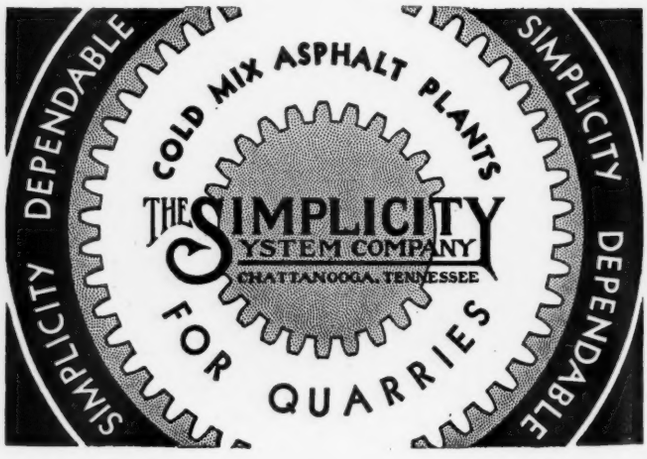

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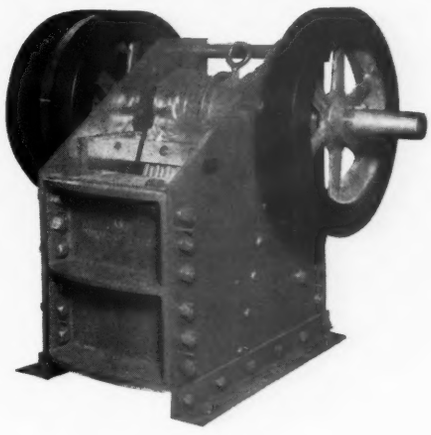

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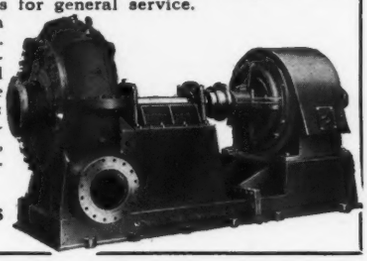

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2-200	G. E.	2200/440	Synch.	514
1-200	Wsthse.	440	Slip Ring	500
1-200	F. M.	440	Slip Ring	600
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- ☐Locomotives, Steam
- ☐Log Washers
- ☐Measuring Devices
- ☐Mills, Compartment
- ☐Mills, Tube
- ☐Mixers, Plaster
- ☐Motors, Electric
- ☐Motors, Gasoline
- ☐Motor Trucks, Ready Mixed Concrete
- ☐Nozzles, Hydraulic Mining
- ☐Nozzles, Gravel Washing
- ☐Nozzles, Spray
- ☐Nozzles, Dust Settling
- ☐Nozzles, Suction Hose
- ☐Nuggets, Grinding Perforated Metal
- ☐Poidometers
- ☐Pulleys, Clutch
- ☐Pulleys, Magnetic
- ☐Pulverized Fuel Systems
- ☐Pulverizers, Ball, Conical, Pebble
- ☐Pulverizers, Disc
- ☐Pulverizers, Hammer
- ☐Pulverizers, Ring
- ☐Pulverizers, Rod
- ☐Pulverizers, Roll
- ☐Pumps, Centrifugal
- ☐Pumps, Deep Well
- ☐Pumps, Sand and Gravel
- ☐Pumps, Slurry
- ☐Pumps, Steam
- ☐Radiators, Engine Cooling
- ☐Rails
- ☐Refractories
- ☐Respirators
- ☐Rollers, Conveyor
- ☐Rolls, Crushing
- ☐Rope, Wire
- ☐Safety Appliances
- ☐Sand-Lime-Brick Machinery
- ☐Scales, Track
- ☐Scales, Truck
- ☐Scrapers, Dragline
- ☐Screens, Revolving
- ☐Screens, Shaking
- ☐Screens, Vibrating
- ☐Separators, Air
- ☐Separators, Dry Centrifugal
- ☐Separators, Magnetic
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- ☐Shovels, Steam
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- ☐Sleeves, Dredge
- ☐Slugs and Nuggets, Grinding
- ☐Speed Reducers and Gears
- ☐Spray Nozzles
- ☐Sprays, Paint
- ☐Sprockets
- ☐Steel, Tool
- ☐Stokers
- ☐Switches, Track
- ☐Tanks, Concrete and Steel
- ☐Tanks, Sand Settling
- ☐Tanks, Wood
- ☐Thickeners, Slurry
- ☐Track, Portable
- ☐Track Shifters
- ☐Tractors, Crawler
- ☐Tramways, Aerial
- ☐Trippers, Belt
- ☐Trippers, Tramway
- ☐Unloaders
- ☐Valves, Pump
- ☐Washers and Scrubbers, Sand, Gravel, Stone
- ☐Weighters, Automatic
- ☐Welding Supplies
- ☐Wheels, Car
- ☐Winches
- ☐Wire Cloth
- ☐Wire Cloth, Manganese Steel

To be used for ... .

Firm Name ..... *Individual* .....

Address ..... *City* ..... *State* .....

The PIT AND QUARRY Employment Service for subscribers has registered the following applicants for positions. Perhaps you have an opening in your organization for one of these men. If so, PIT AND QUARRY will be pleased to put you in touch with the applicant if you will advise us which one fills your requirements.

1-A. 12 years' experience Highway construction and sand and gravel. Can design and install own pits. Ready-Mix concrete. Have operated Central Mixing plants.

4. Stone Quarry Supt. or Supt. asst. 12 yrs. experience in commercial stone and railroad ballasting; operating and repairing all kinds and makes of equipment. Wide experience in drilling and blasting. A-1 references.

5. Chief engineer cement plant; 10 years' experience; desires connection with engineering or manufacturing firm, either in the office or in the field.

9. Quarry foreman, 6 years' experience.

10. Superintendent; 10 years' experience; lime and stone.

11. Superintendent crushed stone; 25 years' experience.

12. 10 years' experience in production of crushed gravel and sand; design engineer and builder; general superintendent; has had some sales experience. Experience covers the entire field.

14. Thoroughly experienced superintendent who has also in the past been assistant superintendent and foreman of granite and lime quarries; at present not employed.

15. Experienced superintendent or manager; graduate engineer; 12 years' experience in sand and gravel production and plant design.

16. Superintendent, 30 yrs. experience, mine, mill and quarry and large shovel operations, thorough knowledge of various systems of underground and open pit mining. Development work from grass roots to mill construction and operation, copper, iron, zinc and non-metallics, 4 yrs. special work in asbestos, mica and kaolin, good organizer and good production and safety record but not a college graduate. South, Southwest or Tropics preferred.

18. Superintendent of stone crushing and sand and gravel plant with considerable experience in operation of dredges, draglines, electric and steam shovels, all kinds of crushing, conveying, screening equipment. Can furnish excellent references, good record and details of past experience.

19. Electric Shovel Operator with considerable experience. Also power-house and general electrician, maintenance, welding, repairing gasoline truck motors, crushers, screens and various kinds of equipment.

20. Crushed stone superintendent since 1903; prefer West or Southwest territory; thoroughly experienced in construction and operation of plants, know how to get best results from the quarry end.

21. Cement plant superintendent or heavy limestone quarry; 20 years' experience in construction and operating plants.

24. Superintendent, stone quarry or slag plant 16 years office and operating experience.

25. Dragline, Crane and Shovel Operator, 9 years' experience in steam and 3 years on electric shovel (Marion), desires position as operator. Can do own repairing. Permanent connection desired. Married. References furnished. Will go anywhere, but a location near good schools preferred.

26. Operator with 5 years' experience on Link-Belt and Koehring cranes. Also 7 years' experience in sand and gravel pit. Available now. Go anywhere.

27. Laboratory work, 3 years' experience as Asst. Chemist doing control and analytical work. College graduate, B. S. degree.

28. 12 years' experience as cement burner and night foreman and watchman.

29. 14 years' practical quarry experience, office, sales, management, superintendent, reconstruction, etc. Open for new connection with progressive company, preferably sand and gravel concern.

30. Crushing plant and quarry Superintendent. Experience includes erecting, rebuilding and repairing machinery. Successful in organizing labor for economy. References furnished.

31. Superintendent crushing plant. 10 yrs. limestone and rock asphalt quarry operation experience. Can furnish best of references. Will go anywhere.

32. An overhead traveling bridge crane man. Experienced. Can give good references. Willing to go anywhere.

33. Cement mill general foreman, 12 years' experience, familiar with all requirements in construction and operation. Available immediately. Can locate anywhere. Single.

34. Capable man. 53 years old. Married, experienced in quarry and crushing plant, timekeeping, payroll and plant office work, seeks position as assistant superintendent, general foreman or plant office work, where experience and loyalty will be appreciated. Will not be interested in investing money at the present time in any position. Have you an opening?

35. Superintendent of crushing and quarrying plant. 14 yrs.' experience in cement business, including changing plants from dry to wet process. Can furnish references.

36. Cement Mill Chemist with 4 years of cement mill work on both wet and dry processes, and 8 years of wide experience in organic analytical work covering all problems incidental to the manufacture of cement.

37. Office man experienced in general office work, correspondence, sales and operations, desires similar position with large lime, cement or gypsum concern. Nine years with Southern lime firm. Age 27, single. Willing to locate anywhere. Available immediately.

38. Situation wanted as Manager or Superintendent of a progressive crushed stone plant where ability and experience would be appreciated. 38 yrs. of age. Scotch birth. American citizen. 15 yrs. experience in quarrying and crushing plants. Now available. Best of references. Location in eastern or middle states preferred.

39. Ten years experience as Burner man; reliable. Age 37. Desires position where ability and skill will be appreciated by advancement. Available immediately.

40. Man with 10 years practical experience in civil engineering and highway construction of all kinds as well as bridges, grading, culverts, etc. Understands map making and topographical survey. Included with this is 4 years tracing and drawing. 3 years with army engineers in Panama. Salary no object.

42. General superintendent or manager; experienced graduate engineer.

43. Sales Engineer desires making change, preferably New England territory. 20 yrs. experience with a reputable concern designing, estimating and selling material handling equipment in all phases. Broad acquaintance among executives and buyers.

44. Want position as carpenter or millwright, capable of taking charge of gang. Steady work preferred with cement company.

45. Operator with ten years' experience on Bucyrus-Erie Steam and P. and H. Gas Shovels in grading, gravel pit and stone quarry work. Can furnish references.

46. Gravel plant supt. or manager. 10 yrs. supt. of large railroad and trucking plants. Experienced in erection and care of gravel plant equipment. Can furnish best of references. Services available at once. Will go anywhere.

47. Graduate Engineer. 25 yrs'. experience as designing, constructing and operating Engineer, as well as Supt. of stone crushing and gravel washing plants, also heavy rock blasting.

48. Graduate Engineer. Wide experience as mining, consulting and sales Engineer, in charge of all outside operations, construction and maintenance. A-1 references.

49. 15 yrs'. experience in erecting and operation, crushing, grinding, washing, drying, screening and separation plants. Know value of low production costs. Good references.

50. Gravel Plant Supt. 7 yrs'. experience erecting and operating gravel plant equipment for large manufacturer. 2 yrs. in charge of mining operations in Brazil. Best of references.

51. Supt. of crushed stone and gravel plants. 12 yrs. experience. Familiar with maintenance and repair work on all types of equipment. Can handle men. First class references.

52. Past experience with Crushed Stone and Sand and Gravel plants; in sales, can figure with contractors, scales, cost, timekeeping, bookkeeping, general all-around man.

53. Quarry superintendent with years of experience in all operations, such as stripping, drilling, blasting, shovel loading, crushing, sinking, also repairing of all quarry equipment and familiar with all phases of washing crushed stone. Now open for proposition. Excellent reference.

54. Engineer experienced in Mechanical, Structural, Electrical, Plant Design and Layout, Estimating, Field work, Maintenance and Millwork desires position. Will locate anywhere.

55. Superintendent of crushed stone products plant and quarry. Twenty years' experience in this and foreign countries in charge of operations. Familiar with modern up-to-date methods and profitable application of same.

56. Master Mechanic, thoroughly trained in the upkeep of crushers, steam shovels, gas and diesel equipment, etc. Reference and complete information on request.

Can You Use THESE MEN ?

Employment Dept.
PIT AND QUARRY
538 So. Clark St. Chicago, Ill.

57. General operating Superintendent desires position with progressive Lime or Cement Company. 20 years' experience as operating superintendent and master mechanic. Familiar with Limestone quarries and burning of limestone and Portland Cement with natural gas or Producer gas. Master Mechanic of large Lime and Cement plants. Installed reasonable system which did not bar progress of operation. References A-1.

58. Position as Superintendent by graduate Mining Engineer. 35 years old with wide operating experience in large open pit mines and crushed stone plants up to 10,000 tons. Thoroughly experienced in Quarry layout, development, heavy blasting, shovel loading, transportation and mill design and operation, electric or steam power, and with latest type high speed reduction crushers, screen analysis of a sampling and grading of specification stone.

59. 13 years' experience in general office work, including correspondence, sales and operations. Well acquainted with freight rate structures on crushed stone, sand and gravel and cement. Desire connection with any concern where ability and experience would be appreciated.

60. Slackline Cableway operator. 5 years' experience. Can keep cableway operating at full capacity. Can do repair work. Had experience raising and lowering mast or tower. Can do all necessary rigging around cableway.

61. Wants position as foreman of a rock, sand and gravel, or oil-mix plant, preferably the latter. Several years' experience as foreman of oil-mix and hot stuff proportioning plant. Can furnish best of references from previous employers and contracting engineers. Will go anywhere but prefer the west or middle west.

62. Position wanted as quarry superintendent. Prefer southwest or west coast.

63. Stone Quarry Supt. or Supt. asst. 14 yrs. experience in commercial stone and railroad ballasting; operating and repairing all kinds and makes of equipment. Wide experience in drilling and blasting. A-1 references.

64. Position wanted by operator with 15 years' experience on cranes, shovels, draglines, sand pumps, dredges, etc. 35 years of age, can furnish A-1 references. Will go anywhere.

65. Graduate mechanical and structural engineer with wide experience on cement and stone plants. Permanent or temporary employment.

66. Superintendent or Foreman of Quarry and Crushing plant or Sand and Gravel plant. 30 years' experience. Can make good anywhere. A-1 references. Available now and will locate anywhere at moderate salary.

67. Successful manager of stone crushing plants, also sand and gravel pits, desires position where previous experience will prove of mutual benefit. Can also sell sand, gravel and stone products or machinery and electrical equipment.

68. Superintendent and Foreman with wide experience in operation of slag, sand and gravel and stone plants. Also experience in railroad work, road construction, grading, ditching, bridges, concrete work, all kinds of excavation, government inspection. Can operate gas and electric cranes. Best of references.

69. Engineer and draftsman, fifteen years' experience, machinery design; structural; plant layout, development, thoroly acquainted with architectural and mechanical design. Technical graduate, also business management and administration course, Alexander Hamilton Institute. Field and office experience. Age 37 years. References.

70. Office man, 10 years' experience in general office work, payrolls, costs, and operations. 9 years with Gypsum Co. Age 30, married, and A-1 references. Will locate in Eastern and Middle States. Prefer lime, cement and gypsum concerns. Available immediately.

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